COAL AGE

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Enlarging the Coal Operator's Field for Profits

THE inherent ambition of every coal producer to dispose of his product direct to the ultimate consumer is just as much of a fundamental law in industrial life as is that physical law which concerns the action of gravity. Though the process may be slow and circuitous, the final result need never be in doubt; it is all a matter of evolution.

Unlike a great number of commodities which readily lend themselves to a direct exchange between producer and consumer, coal has always been a product which necessitated the services of an intermediary. First it is bulky and difficult to handle; then there is the wide geographical distribution of the product. Furthermore, the vast army of consumers scattered over the United States are but slightly acquainted with the source of the coals they use, and they so limit their sphere of activities and their knowledge of fuel matters that the middleman naturally came into existence and has performed a valuable service.

In truth, the middleman in the coal industry would be a permanent fixture were it not for the fact that severe competition and stern labor demands render it necessary for the operating companies to extend their sources of income. One way for the producer to do this is to assume the functions of the middleman. Competition always means consolidation. The middleman is the only factor acting between the producer and the consumer of coal upon whom a "saving" operation can be performed. Production costs have been reduced to a minimum, and with the return of bitter rivalry for markets there arises a need for increased profits. The logical way out is for the operator to add distribution to his field of productior

No one familiar with the situation can honestly question the value of the service which the middleman has performed. His is a work that must be recognized as indispensable even by those who regard him with disfavor. He may be eliminated, but the service he performs cannot be done away with, although the producer may take over his job in the ordinary evolution of things.

For several years there has been a decided trend along this line. More and more of the larger producing companies are establishing selling agencies in the various important cities. These agencies, however, up to the present time have catered mostly to the large consumers, including the railroads, leaving the small consumers to the middleman. The disturbed markets of today are causing the coal operators to reach out for this business, which individually does not amount to much, but in the aggregate totals a large tonnage. In nearly all states retail establishments are either being erected or are being purchased by the coal producers. New England in particular has witnessed such an invasion of the distributing field.

The coal industry for several reasons has never stood high in public favor. It has had few friends at court and has always been the popular object of newspaper attacks. Mine operators are only just now commencing to see the wisdom of standing together. Diffidence must disappear if profits are to remain. The public must know the true story of coal. Nothing is gained by an attitude of submission and silence.

Real efficiency will only come when the coal producers learn the art of distribution as thoroughly as have the meat packers and the oil refiners. Genius for organization is not confined to any single line of business. Anticipating such a process of development, the alert middlemen are fortifying themselves against approaching extinction. Some are becoming the sole owners of new and promising mines; others are consolidating their interests with those of friendly producers. In other words, coal distributors are not defying the inevitable, but are meeting it halfway. Thus the middleman in name may be eliminated, but his function will still go on, like John Brown's soul.

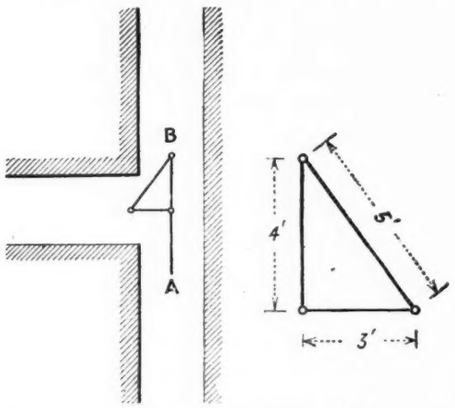
IDEAS AND SUGGESTIONS

Method of Driving Rooms Without the Aid of Regular Sights

BY OSTEL BULLOCK
Cleaton, Ky.

There are many men who study out the easiest and the quickest way to do things. In the mine where I am employed at present we have an engineer who does not get around oftener than once a month, and sometimes it is longer than that. Consequently, we had trouble from new rooms getting off centers before we could get sights put in them. This was annoying, as in such a case we would have to relay the road and retimber the places. Furthermore, getting off center weakened the pillar on one side and left a lot of coal on the other. I finally made a contrivance that answers the purpose. It can be constructed by any one in a few minutes and is accurate enough for driving short distances where no engineer is at hand to set points.

I took three small rings, as shown in the diagram. I then cut three lengths of small string—3, 4 and 5 ft. long respectively. After fastening these three strings to the three rings, I had a "triangle." To use this I take any two points *A* and *B* on the entry center line in front of a roomneck opening. Between these two points I strike a chalk line. Then, having found the intersection of the roomneck center line and the chalk line already struck, I place the ring forming the intersection of the 3- and 4-ft. strings at this point with the 4-ft. string extending along the chalk line in the entry. The 3-ft. and 5-ft. strings are then drawn taut. The room



HOW TO DRIVE ROOMS WITHOUT REGULAR SIGHTS

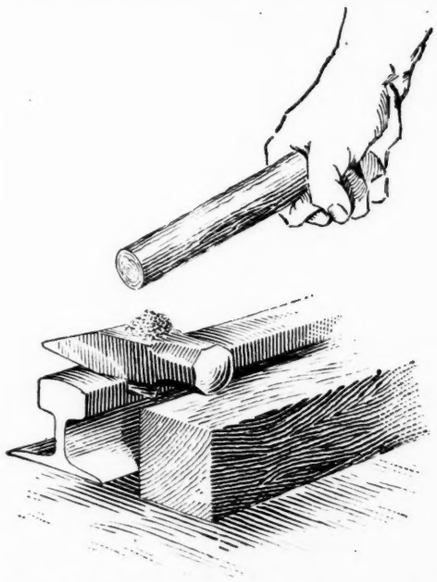
sights will be along the 3-ft. string. Then, by putting in a spad at the end of the 3-ft. string, and one on the entry, the set of sights thus made will serve for driving 60 or 70 ft. with only a small error.

Much of the accuracy obtained depends upon the care taken in placing the sights and the size of the strings and rings used. To turn at a 45-deg. angle it is only necessary to sight from the same point on the entry to a point in the center of the 5-ft. string.

To Remove a Broken Handle from Hammer or Sledge

BY A. P. O'CONNOR
Homer City, Penn.

Much annoyance is occasioned by the breaking of a hammer or sledge handle when there is no means at hand wherewith to remove the piece that remains in the eye. A good way in which to remove the troublesome piece is to place it in such a position that the eye is di-



REMOVING PIECE OF BROKEN HANDLE

rectly over a hole dug in the bottom, or one end may be placed on top of a rail and the other end on a tie (or similar arrangement), so that there is nothing to hinder the piece from coming out. Then throw a handful of dirt on top of the eye and pound it with a pole, ax, hammer or some such tool. Repeat this operation as rapidly as possible and note the surprising ease with which the piece will be driven from the eye.

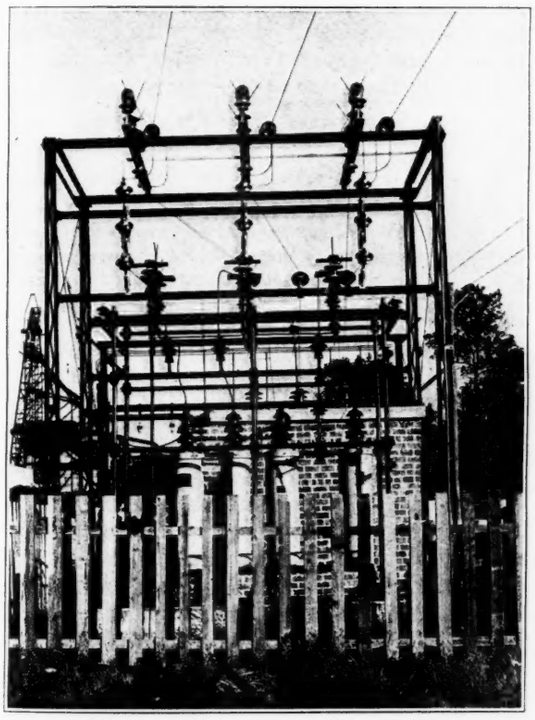
New Type of Outdoor Substation to Meet Severe Service Requirements

BY H. W. YOUNG
Chicago, Ill.

The increasing tendency of coal-mine operators to purchase power has resulted in the development of outdoor substations to meet the severe requirements of this service. There is a growing recognition of the fact that insulation should be of high quality so that heavy deposits of dirt will not cause failure by insulation leakage. This means that the equipment should have what is generally termed an abnormal factor of safety. This can be secured by the use of higher rated insulators than are ordinarily employed.

A new type of outdoor substation designed to meet the imposed conditions is herewith illustrated and a description of this equipment will be of interest at the present time. The power is made up of expanded steel sections heavily coated with rust-resisting paint, and so designed that it is shipped in sections easily bolted together at the point of installation. At the tower base is located a house of such dimensions that the high-tension auomatic oil switch and metering equipment can be easily installed and operated therein. The transformers on the opposite side of the tower are located within a steel inclosing frame which also carries the bus supports for both high- and low-tension transformer buses.

Control of the high-tension side is secured by means of a three-pole air-break switch operated from ground level by means of an interlocking switching mechanism. Lightning protection is secured by means of choke coils mounted on the switch base and so connected that incoming disturbances are reflected to the electrolytic arresters where they can be quickly discharged to ground. Between the line and the arrester are mounted



NEW TYPE OF OUTDOOR SUBSTATION

three single-pole disconnecting switches with limit fuses. By opening these switches the arresters can be safely inspected and adjusted. In case of arrester trouble, the limit fuse will operate and prevent excessive current flow.

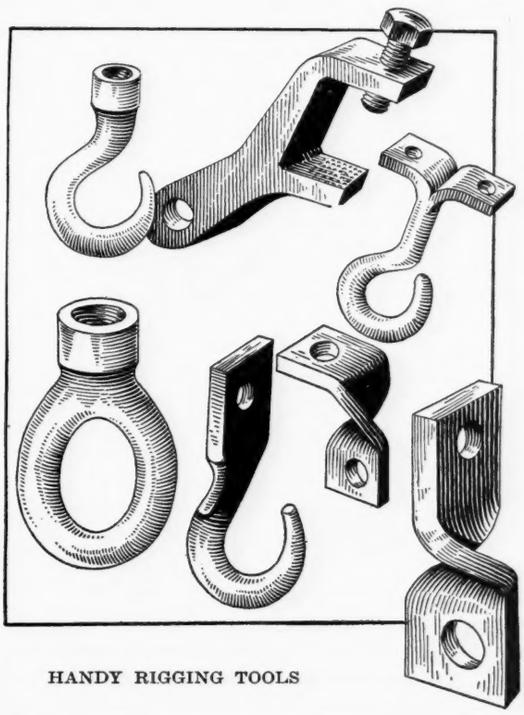
The high- and low-tension transformer buses are carried on bus supports having insulators of the same type as are used on the switching equipment. The general design is such that unskilled labor can be employed for both installation and operation, thus keeping costs at a minimum.

"Reputations are easily made; character must be hammered out on the solid forge of time."

Rigging Helps for Quick Erection of Block and Tackle

By Charles H. Willey
Concord, N. H.

The handy rigging tools shown in the accompanying illustration are all quite simple, yet they have proved useful; for with this assortment in the tool box or locker a block and fall or chain tackle can be rigged up



HANDY RIGGING TOOLS

readily and quickly almost anywhere. There is no need of dimensions or descriptions of these devices, as they must be made to suit local needs. However, a couple of clamps such as those shown have proved the handiest of the lot. The hole in the lug should be sufficiently large to receive a tackle hook, and if heavy work is to be handled the clamp should have two securing screws.

Carbon and Commutator Wear

By R. E. Hellmund
East Pittsburgh, Penn.

Carbon manufacturers, as well as builders of dynamo-electric machinery, have made numerous tests to determine contact resistances, friction losses, etc., of various brushes. While such tests are of interest, they contribute little toward the real practical need; namely, a substance that can stand high current densities and high sparking voltages with small wear.

In order to develop carbons having such qualities, it would seem essential to first make tests to determine how the wear is affected by current density, sparking voltage and peripheral speed. Present indications are that with many commercial carbons appreciable densities can be used if there is no sparking voltage, while sparking potentials up to 15 or even 20 volts across the brush cause little wear at certain speeds, if the current density is low enough. More data along this line should be of great advantage.

Effect of the Velocity of Ventilating Current Upon Mine Explosions

By G. S. RICE and W. L. EGY
United States Bureau of Mines, Washington, D. C.

SYNOPSIS—*A pet theory of many mining men is that ventilation should be reduced during firing. Certain experiments carried on at the Experimental Mine of the Bureau of Mines near Pitsburgh, Penn., would tend strongly to disprove this theory.*

A LARGE number of mining men, particularly in the Southwest, are of the opinion that the velocity of the ventilating current has a great influence in the origination of coal dust explosions. On this account they recommend that the fan be slowed down at shot-firing time, and in some cases have advocated closing the mine openings. The supposed basis for this theory is that a high-velocity air current would furnish more oxygen for the development of the explosion than a low-velocity air current; and further, that if the openings of the mine are not closed, air might enter and, traveling toward the advancing explosion, furnish it with more oxygen.

It is evidently assumed that the oxygen in a quiet atmosphere or in a current moving in the same direction as the explosion is not sufficient to feed the explosion and that a supply from other points is necessary for its development. In connection with this theory a number of tests made in the Experimental Mine of the Bureau of Mines are of special interest.

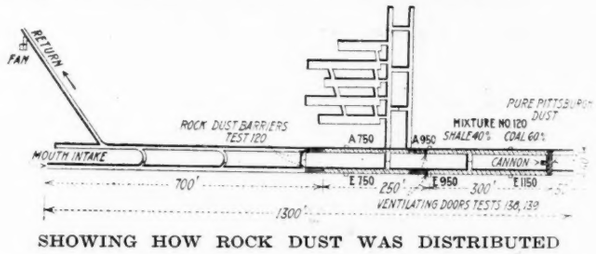
The great majority of the explosion tests in the Experimental Mine have been made with low-velocity air currents, the velocity being about 100 per minute. There are also many tests in which the velocity ranged from 100 to 200 ft. per minute. There are three tests, however, which were made under conditions which should certainly have shown some result of the velocity if this were a factor; these are tests Nos. 138, 139 and 120, in the Experimental Mine series.

In test No. 138, pure coal dust was distributed from the offset in 1250 cutthrough to E and A 950 (see accompanying diagram), at which points the entries were closed by rock-dust-protected ventilating doors, the entry door opening inby and the aircourse door outby. These doors were closed during the test so there was no air current moving in the explosion zone. The explosion was originated by firing the usual charge of 4 lb. of black blasting powder from the cannon in the offset, and the resulting flame or explosion velocities were high, and pressures strong.

In test No. 139, the arrangement of igniting the shot and the zone was similar, except that outby a coal dust ignition zone, in the 1250 cutthrough a mixture of 50 per cent. shale and 50 per cent. coal was distributed at the rate of 4 lb. per foot to E and A 950. No difficulty was encountered in this test in obtaining an explosion, the development being roughly symmetrical in the two branches with pressures of 25 and 17 lb. at E and A 950 respectively.

If closing the explosion zone so near the origin had no effect in preventing the origination of an explosion, closing the openings of an operating mine which may have large areas of open workings underground from which air would be available to assist in the explosion, were the theory mentioned correct, would certainly have no influence. These two tests show that for the development of a violent explosion there is no necessity for oxygen supply other than that present in the air in the explosion zone.

In test No. 120, June 11, 1914, which was made in the presence of many of the members of the Mine Inspectors' Institute of America, a high-velocity air current was used. The ignition zone in the 1250 offset and cutthrough was prepared with pure Pittsburgh coal dust, while in the entry and aircourse outby to E and



SHOWING HOW ROCK DUST WAS DISTRIBUTED

A 700, a mixture of 60 per cent. coal dust and 40 per cent. shale dust was distributed at the rate of 3⅓ lb. per foot. Barriers of various kinds limited the explosion zone at different points. An air current with a velocity of 850 ft. per minute was intaking on the main entry and returning on the aircourse. The arrangement permitted a comparison of the development of an explosion in two parallel entries, with dust distributed in the same manner and amount in each, but with the main entry swept by a high-velocity air current traveling toward the origin, while in the aircourse the air current traveled away from the origin.

When the shot was fired, dust clouds came from both entry and aircourse openings. Inspection of the flame recorders indicated the explosion had reached the end of the zones in the two entries. The explosion was a relatively weak one, with low velocities, as was intended. This was attained by using a high percentage of shale dust in the dust mixture.

When the instrument records were plotted it was found that the development of the explosion in the two entries was quite similar, the velocities in the aircourse, which was the "return," being a little greater than those in the entry, which was intaking. It required 3.2 sec. for the flame to reach E 1150 and 2.9 sec. to reach A 1150, while the records at E 750 and A 950 respectively were 6.5 and 5.1 sec. It will be seen that the velocity of flame from the origin to A 1550 was only a little greater than

that to E 1150. The average, as indicated by time of melting of foils, in entry and aircourse between stations 1150 and 750 were 182 and 121 ft. per second respectively. The pressures developed were light, being 5 lb. at E 1150 and E 750, 2 lb. at A 1150 and A 750. Thus there was practically no difference in the development of the explosion in the intake and the return.

It is believed from this and other tests that the velocity of the air current has no appreciable effect on the development of the explosion. The first effect of the shock wave of the igniting shot is to send out a pressure wave radiating in all directions, which reverses the direction of the air current when the latter is in the opposite direction. This is clearly shown by the pressure diagrams and records of the air vanes in many of the Experimental Mine tests.

It therefore makes no difference, so far as the propagation of an explosion is concerned, what the velocity was before the shot was fired, since immediately afterward the movement is away from the shot in all directions. After an explosion has passed any point, the current of gases and residual air reverses and flows back toward the origin, followed by fluctuations until equilibrium of atmosphere pressures is established throughout the mine.

It is therefore concluded that the theory of slowing the fan or closing the mine openings to reduce the possibility of the origination of an explosion is founded on false premises, and there is no reason in favor of following the practices founded on this theory. On the contrary, there is great reason for not doing it since the slowing down of the air current may permit the accumulation of gas in some parts of the mine and fail to carry off effectively the gases resulting from the shotfiring.

Algerian Market for American Coal

By Consul Arthur C. Frost
Algiers

With the exception of a negligible quantity of lignite and bituminous deposits, Algeria is dependent upon other countries for its coal supply. Before the war this commodity was imported principally from Great Britain. France, Germany, Holland, Belgium and the United States supplied the remainder. Since 1916 a large portion has come from France, in accordance with the policy of tonnage conservation.

Due to the difficulties of transportation, the imports of coal have rapidly dwindled since the beginning of the war. The total imports into Algeria, including bunker coal, have been as follows: 1913, 2,251,000 metric tons; 1914, 1,692,000 tons; 1915, 1,491,000 tons; 1916, 1,153,000 tons; and 1917, 757,000 tons.

For interior consumption the quantity and value of the coal and coke imported into the colony were as follows: 1913, 530,622 metric tons, value $2,073,000; 1914, 427,624 tons, value $2,685,000; 1915, 313,937 tons, value $3,722,000; 1916, 325,798 tons, value $6,661,000; 1917, 228,262 tons, value $8,310,000. Although the quantity received in 1917 but slightly exceeded one-half the quantity received in 1913, the value was over four times as much.

According to the statement of an official of the State Railways, Algeria was receiving monthly about 20,000 tons of coal the latter part of 1918. The State Railways are charged by the Government with the distribution of coal to all industries as well as to the railway lines in North Africa, including certain lines in Morocco. Double this quantity is needed to enable industrial establishments and public utilities to resume normal operation and to supply householders, who have been almost deprived of coal for the past two years.

Because of higher freight charges, American coal has in the past been unable to compete to any extent with British coal. The quantity and value of the coal imported from the United States from 1912 to 1915, the latest year American coal was received, follow: 1912, 3810 metric tons, value $17,000; 1913, 24,917 tons, $112,000; 1914, 22,062 tons, $102,000; 1915, 6455 tons, $68,000. In the spring of 1917 negotiations were practically completed for the purchase of 150,000 tons of American coal for delivery within a year. Owing to the entrance of the United States into the war and the requisition of tonnage this contract, arranged with the American coal companies through the Société Internationale d'Expansion Industrielle et Commerciale, 32 Avenue de l'Opera, Paris, France, could not be fulfilled.

The construction of a large American merchant marine presents an opportunity for the development of the coal trade of North Africa. In addition to coal for internal consumption in Algeria, the United States should be in a position to supply bunker coal, especially for its own ships. Before the war Algiers was one of the principal coaling stations on the Mediterranean. Due to war conditions, however, the number of vessels calling here for supplies has steadily dwindled, and, in fact, during the past two years Oran has exceeded Algiers in supplying vessels.

Furthermore, Algeria presents opportunities for return cargoes perhaps greater than certain other Mediterranean regions offering markets for American coal. To a large degree American exports to the Mediterranean consist of bulky commodities, such as cotton, grain, coal, petroleum, machinery and metal products, and exports from this region are largely made up of articles of small volume but of relatively high value, notably food products. The result is that most vessels westbound are in ballast or carry small cargoes only.

Algeria, however, exported before the war considerably over a million tons of iron ore, and the full resources of the colony in iron ore are yet to be realized. The region about Bougie has been called the Algerian "Bilbao." The colony exported as well considerable quantities of zinc, lead and some copper. Manganese, mercury, and antimony are also found. A great part of Algeria's minerals were before the war exported principally to countries other than France. England and Holland were the best customers, followed by Belgium, Germany, Austria-Hungary and the United States.

The coke production of the United States in 1917 was about 56,000,000 tons, of which approximately 34,000,000 tons was produced in bee-hive ovens and over 22,000,000 tons in the byproduct type. If the 34,000,000 tons of coke had been made in the byproduct oven, some 9,000,000 tons of coal might have been saved; this saving represents about 10 per cent. of the coal used for domestic purposes in 1917.

Missouri Coal Trade Conditions in 1918

By E. J. WALLACE
St. Louis, Missouri.

IT WAS NOT with a flourish of trumpets that 1918 was ushered in by the coal trade. In fact it was unlike the incoming of the two previous years, for the Fuel Administration had a firm hand on the coal business in St. Louis.

The steam trade as a whole fared better in St. Louis than it did in any other city in the country east of the Rockies. No record has been made of any factory or industry going down for the actual need of coal. This was due chiefly to the splendid work of the St. Louis Fuel Committee, which was helped materially because Lieutenant-Governor Wallace Crossley, Fuel Administrator for Missouri, had jurisdiction over the East St. Louis, Ill., switching limits. As a result the available coal was distributed so that everyone got some.

The domestic consumer began the year with a hope that sufficient coal would come in to enable the delivery of more than half-ton lots. Things were more critical with the householder than with steam plants. There was little coal in the homes, and for the first few weeks the city was sorely beset. At this time the city opened its municipal coal yards in the poorer sections, and coal was sold in small lots to the needy.

Little Carterville coal came in as the year opened. The same applied to DuQuoin. The railroads seemed to get most of it, from the St. Louis viewpoint. Mt. Olive was the chief high grade, and Standard coal, which in normal times was beneath recognition for general domestic use, became a highly esteemed fuel.

Railroads Bought a Large Tonnage

The railroads drained both the Mt. Olive and Standard fields of an enormous tonnage over what they had taken in the past. The Terminal Railway of St. Louis, which was without any storage supply through lack of foresight, confiscated coal indiscriminately and was called to task by the Fuel Administrator. Incompetent railroad fuel agents were brought into the limelight, and for once their plan of holding up the operators proved their undoing and an expensive problem to their companies. There was no Pennsylvania anthracite coming in during the first few weeks of the year and no smokeless at all.

The coldest weather for 30 years was experienced in January, and the snow at times tied up everything. The Laclede Gas Light Co. was ordered to take conservation measures on account of its storage being used up. The Anheuser-Busch Brewing Association was ordered to sell to the gas company any part of 14,000 tons of Pittsburgh coal that it had in storage for the past 14 years. This saved the day for the gas consumer in St. Louis. The closing order affecting non-essential lines of business issued by the State Fuel Administrator saved gas and also light.

January was the real critical month in St. Louis and the territory adjacent. Mines in the Standard field, upon whose output St. Louis depended, were idle for from a week to ten days at a time through many causes, principally poor rail management.

February brought somewhat easier conditions. The Fuel Committee on Feb. 1 estimated that St. Louis was getting along fairly well with a shortage of 95 cars per day. The steam and domestic requirements were shown to be 550 cars per day. The retail demand was from 250 to 300 cars per day. There were 243 essential food and war contract plants that had to have 12,000 tons per week, and 227 other essentials needed 15,000 tons per week.

Much improvement was apparent as the month progressed, in spite of the Illinois Central R.R. and the St. Louis Terminals going to pieces. Embargoes were put on by the carriers and removed by the Fuel Administration. Cars were furnished mines one day a week, and it was almost another week before they were moved and from one to two weeks before they were delivered. There was much uneasiness over the proposed zoning and the elimination of the jobbers' margins. This affected the country trade seriously. To help them out, especially in southern Illinois and Arkansas, the Missouri Fuel Administrator diverted several cars of coal from St. Louis.

Roads Confiscated Domestic Coal

No Carterville came into St. Louis, and on the Missouri Pacific lines in southeast Missouri, Arkansas and Louisiana the situation was alarming. No rates from other than the Carterville field were in effect, and the Missouri Pacific confiscated nearly all the domestic coal that went that way.

Toward the end of February the weather moderated and conditions became easier. Some 1500 tons of anthracite had moved in, but no smokeless, and nothing from Arkansas. The carriers did not, however, show much improvement in their work. Mt. Olive coal had become easier, and Standard was available for some storage supplies although the carriers were apparently taking more tonnages from all fields than in the previous month. The mines supplying St. Louis for this month averaged from nine to twelve days' work, the poorest showing being on the Louisville & Nashville and Illinois Central lines.

At the close of the month retail conditions were easy, and when March opened the situation did not occasion any worry. The early part of March presented the weakest link in the chain, the Louisville & Nashville putting on embargoes without any valid reason. This carrier and the Illinois Central rendered extremely poor service until after the middle of the month, when there was an improvement. At this time the Terminal situation became somewhat like normal, and more prompt delivery resulted.

The supply of Mt. Olive coal became more plentiful, and at the end of the month there was an oversupply. However, it moved in heavy tonnages to Nebraska and the northern market. Carterville was scarce, little coming in at any time, while Standard became a drug on the market with unbilled coal at the mines and at East St. Louis, with some slight price reductions here and

there. The steam trade bought somewhat begrudgingly, and steam sizes were also heavy. The domestic demand was good in the early part of the month, but at the close it was not a factor. During the month about 3000 tons of anthracite moved in. There was no smokeless and no Arkansas.

The matter of contracting was purely a gamble, but many contracts were made during March. Most of these indicated that the shipper had less faith in future high prices than the consumer. The usual contract called for a maximum and minimum tonnage of the screened sizes, with the understanding that if conditions warranted it mine-run could be shipped at the Fuel Administration's price at time of shipment. These contracts for the most part just assured the buyer of his fuel at the Government price. It was a protective policy. The big railroad contracts were made at less than Government figures. This was where the operator was not so sure of the future as the consumer.

Opening of Coal Year Discouraging

The coal year opened in a most discouraging way to the shippers. There was no steam market. It could not be made. Even price would not do it. Sizes that were unavailable for many months, like No. 2, No. 3, No. 4 and No. 5, were going begging. Embargoes against Chicago by the Wabash and Chesapeake & Ohio was the principal cause, and the country demand ceased so suddenly that it hurt the feelings of some shippers who had saved postage by refusing to answer country inquiries for many months prior to Mar. 1.

For a few weeks previous to Apr. 1 an enormous tonnage of all kinds of Illinois coals eased the St. Louis situation. During April the St. Louis market was glutted with this coal, and prices on Standard coal were cut to suit the buyer if one could be found. With the same Government prices in effect as on Jan. 1, Standard lump went down to $2.25 and less, with mine run at $1.90 and screenings at $1.65. This condition prevailed to the end of the month.

Mt. Olive coal was plentiful during all of April, and it held to the maximum Government price. The Carterville situation was discouraging. In an effort to induce the public to buy the most available fuel, and to induce the retailer to store as much as possible, the St. Louis Fuel Committee increased the price of retail coal 30c. per ton. This was 21c. less than the retailers asked, as they produced figures to show that it cost $1.45 to sell coal at retail. The hauling charge is $1 of this. The prices set were a surprise to the public, who had expected a reduction.

Retail demand became good on Carterville coal, just the opposite of what was expected. Dealers had more orders for this grade than they could possibly fill in three to four months. It took from two to three weeks to get a car from the Carterville field, 100 miles away, to St. Louis over the Missouri Pacific and the Illinois Central. The general impression was that some of the roads were trying to render such service as would cast a reflection on Government control. Even the Terminal slipped back several notches, and conditions were trying. There was a good movement of anthracite during the month, several thousand tons coming in, but no smokeless and no Arkansas except the bituminous variety.

In May there was practically no anthracite moving in except some off-grade, off-size stuff, and no smokeless and but little Arkansas. The transportation problem remained as in April. The local steam market went down to its low ebb, and there were hundreds of cars of screenings unbilled that kept down the delivery of screened sizes. The Standard field showed improvement in other sizes as the month advanced, and there was a better tone to the market. This was helped by the railroads coming in for fuel. As a matter of fact they saved the Standard field from absolute demoralization. Railroad fuel is mine-run, and the screening problem therefore vanished. There was plenty of 6-in. lump and somebody got a lot of 6-in. mine-run.

The domestic demand from apartments and off-the-rail plants improved. The Mt. Olive situation was similar to the Standard on screenings, but it improved toward the end, aided by railroad orders and a much better domestic call.

The Carterville condition became alarming toward the close of May. Many dealers were far oversold, and the tonnage became smaller week after week. Then the operators refused to take on more orders until they caught up with those on file. The same applied to the DuQuoin field. There was a break in the maximum prices on Carterville screenings, which went as low as $2, with DuQuoin at $1.75. Standard went to $1.40 at this time.

At the close of the month there was a slipping back to former conditions apparent in the Standard field. This became more pronounced in the early part of June, at which time railroad buying let up. When the roads came into the market again coal was cheaper. So it was for everyone else who could use Standard, but the tonnage moved was nothing to what the condition required.

Freight Rates Advance on Coal

There was a fair movement of everything but screenings for a few days prior to June 25, when the freight rate advanced 20 per cent. on all coal. The Standard market pulled through June in somewhat worse shape than in May. Mt. Olive held its own. There was just demand enough for the supply. Some of this went into storage, while practically no Standard was considered. The Carterville and DuQuoin situation seemed to get worse. The railroad tonnage of these coals became greater, so did the domestic demand, which was insistent.

The heart-breaker to the St. Louis territory was the "no-more-anthracite-west-of-the-Mississippi" order that came in with the month of June. Over 40,000 tons were booked, with no chance of getting any. This caused a furore that was hard to down. The Chamber of Commerce held a protest meeting, but the local fuel committee explained it away on the promise of plenty of coke. Thousands of hard-coal burners were replaced by other stoves, for the coke supply did not materialize in time, and when it did the price was unreasonably high to the consumer. There were spirited contests for what little anthracite was stored. Transportation improved toward the end of the month.

In St. Louis, outside of the zone for Illinois coal, there was a continued demand for Illinois fuels. Some

moved to Nebraska in box-cars, and a little went into western Missouri on special permits. This was soon stopped when the privilege was abused through district representatives sending Carterville coal to their relatives while others who actually suffered for the lack of it went without. During all this time the mines in the Standard field were idle because of no market.

July brought some pleasant surprises. Instead of the market lagging, it picked up. To replace the 40,000 tons of hard coal orders began to come in, and it takes over two tons of Illinois coal (nearer three tons of some grades) to replace a ton of anthracite. So the domestic business resumed. A promise was made of 25,000 to 30,000 tons of coke for the remainder of the season, and the future looked brighter.

The Standard market was affected but slightly at first, but it improved as time passed. However, it was not a healthy proposition at any time during the month of July. The outside country call was good, with fine prospects, because the outlying sections could get no coal of higher grade. The steam demand was poor, and this handicapped the operators. There was some small storage of Standard coal reported, and the railroads waded in now and then when conditions were right and brought relief.

Mt. Olive Market Proves Steady

The old reliable Mt. Olive proved the steadiest of all; not an oversupply, but just enough to swing the call. The Carterville problem seemed to grow. The orders piled up and the incoming tonnage grew smaller. Many consumers were induced about this time to change from high grade coals to coals of a lower grade, which proved a help. Considerable so-called Arkansas smokeless moved in, with some Arkansas anthracite.

It was suggested at this time that too much urging for early storage might be harmful in St. Louis proper. The public was getting anxious about its coal at the end of July, and the dealers were unable to cope with the demand for prompt delivery.

In August it was much the same as in July with regard to Standard coal. Toward the end of the month it became weaker, even though the State Fuel Administrator permitted thousands of cars of this coal to be shipped to Michigan. This helped to steady the market. The Mobile & Ohio was in bad shape for the entire month. Prices for Standard coal were about the same as in July, and the domestic storage of this grade was pretty well taken care of. Steam storage was not so good.

Mt. Olive coal was the steady-going grade, with no changes from the July condition. Carterville and DuQuoin seemed to get worse. Orders kept piling up on the dealers for these fuels. The supply was getting smaller for many reasons, but principally because of decreased production. The railroads drew heavily on this field.

A survey showed that St. Louis was the best coaled city in the country for domestic, and perhaps the poorest in steam storage. No eastern coals came in and but a small tonnage of Arkansas. The latter went up $1.50 per ton, which almost made it prohibitive in St. Louis, although farther west it seemed to move. There was up to now a shortage of coke, but gashouse got easier, with little byproduct available. Country business began to pick up in August, and toward the end of the month transportation improved on almost all the roads.

The lightless day and night orders were a farce here. Mines were idle because of an overproduction of steam coal, and yet at the same time regular avenues of consumption were being eliminated. There was much sarcastic comment on the part of the public over the lightless night order and the skip-stop system. For a while these conditions threatened to create such a surplus of screenings that the price of Standard and Mt. Olive lump almost justified a higher Government price that would permit the screenings to be dumped as in Arkansas, in order to get out any lump at all. Chicago proved to be a good outlet for these cheap screenings.

Fuel Administrator Crossley at this time succeeded in getting Washington to cancel the order preventing brick and other nonessential industries in Missouri from procuring coal for storage and current needs. The Federal Fuel Administration sustained the plea of the State Fuel Administrator through C. E. Morrow, of the St. Louis Fuel Committee, and E. J. Wallace, advisor to the committee, that the basis for gashouse coke prices in the St. Louis and mid-west section should be on the rate from the Earlington, Ky., field and not from Pittsburgh. This rate was $1.70 or $1.85 under the Pittsburgh rate, and coke came down from $9.60 to $7.70 ovens at St. Louis with a refund dating back to July 8.

The market continued easy all through September on Standard domestic sizes. Steam was heavy, and screenings as usual were a drug. The railroad orders helped some, in fact these were life-savers for many mines. Retail business was off, other than for apartments and buildings, which were storing up all the the coal they could get. Mt. Olive moved along tranquilly as usual.

Situation Shows Signs of Easing Up

The Carterville situation showed some signs of easing up for the future, although little coal moved in. DuQuoin coal proved somewhat freer. Retailers began slowing up in their desire to fill every coal bin in St. Louis when the fuel committee announced that fully 75 per cent. of the domestic coal needed up to Jan. 1 was stored. Dealers began to figure out a winter of idleness if it continued that way, and eventually they found they were correct.

Country business was good in the St. Louis territory in September. Failure to get Carterville up to now begot a desire to play safe and take what was offered. This was Mt. Olive, if available; if not, Standard went. At some places in the territory steam plants that could just as well burn Standard were using Carterville, while whole communities could get neither on account of there being no Standard rates in effect to the places where Carterville was used for steam.

The new retail price on gas coke was set at $11.25 with byproduct at $13. The producers agreed to cut this to $12.50, which would be the anthracite price. The producers, however, did not keep their promise, and byproduct later became plentiful because the public would not submit to that kind of a policy. Some Arkansas anthracite—a few hundred tons—and about twice as much Arkansas smokeless came in, but no eastern fuels.

In October the shoe was on the other foot, as the operator began to worry. The market began to slump.

Standard conditions grew worse. Steam buying was light and slow. There was little done in the domestic line. Railroad business practically kept the Standard field going during October. The month was depressing, with an oversupply of all kinds of coal.

Mt. Olive fared better, but showed a weakening. There was some domestic business here, but it was railroad orders and a tonnage to the north and Canada that saved St. Louis from a broken Mt. Olive market. Even Carterville began to ease up toward the last, and the St. Louis territory began to get some. This tonnage gradually increased until at the end of the month some dealers asked that shipments be held up.

Contrary to expectations there was no cold weather in October. This was unusual and was the cause of a slowing up in the outside demand. At this time there were light shipments of Arkansas smokeless.

As November progressed conditions became still more depressing. There was a day or two of chilly weather during the latter part of the month but otherwise it was a record-breaking month for summer weather and no business. Standard mines were idle. Railroad tracks were congested and the yards were full of coal. Plants with storage stocks began to cut into them, and both wholesale and retail prices went to pieces. The latter suffered a cut of 50c. to 75c. and soon brought a like reduction on all other coals.

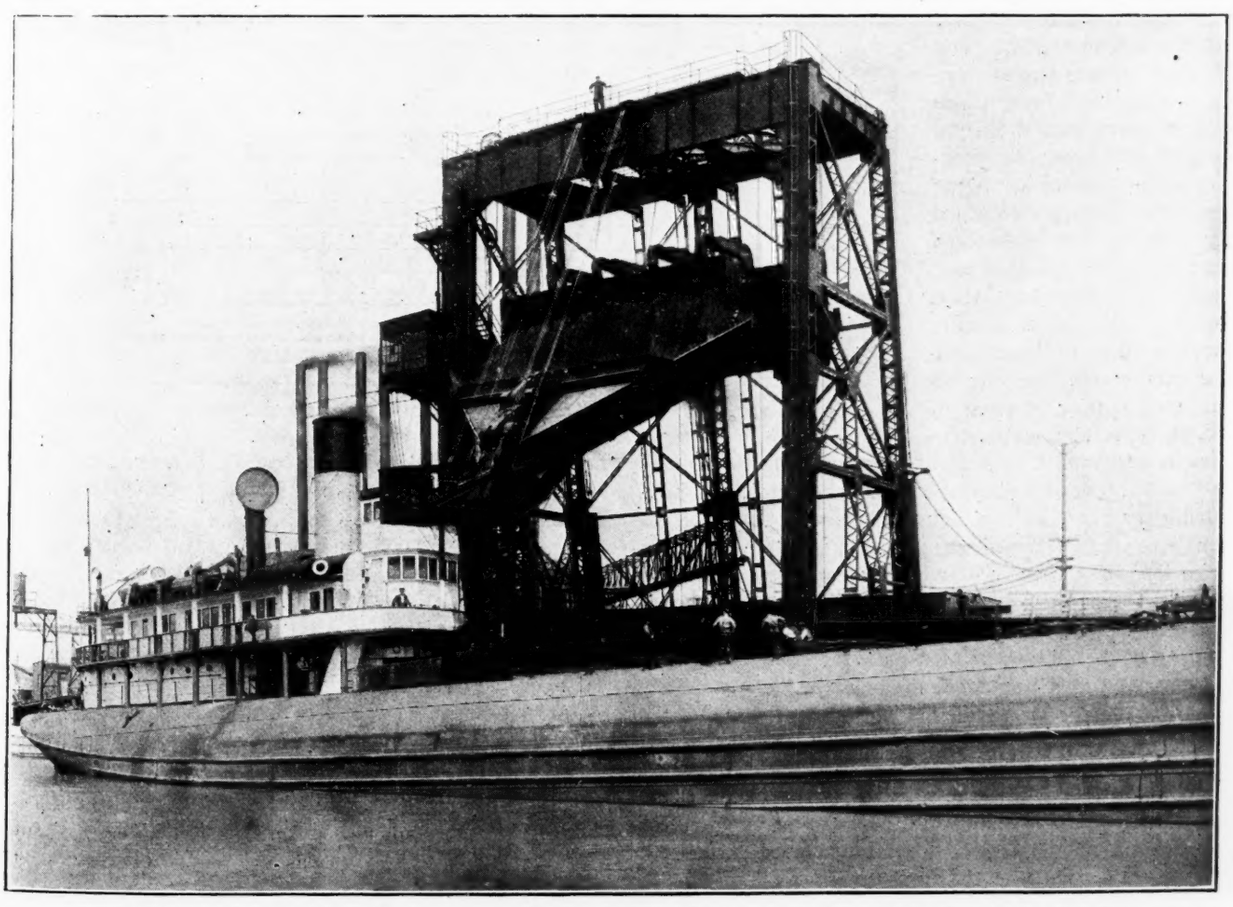
No call for either steam or domestic coal put the market squarely up to the railroads, who waded in splendidly for a few weeks and then laid off to use up their storage piles. Mt. Olive coal fared somewhat better than the other grades. It moved out and north with a railroad tonnage that stayed.

Carterville coal was virtually a drug on the market. On this grade, and also on Mt. Olive, the jobbers' margins were allowed by the operator. Standard got down to $1.40 for screenings, with $1.75 for 2-in. lump to $2 for 6-in., and these prices remained to the end of the year.

December weather conditions were remarkable, not a single cold day being registered during the entire month. It was the mildest winter since 1877. Dealers had nothing to do; domestic orders were being made for one-half and single tons. It was a standstill month.

Mines whose output came to St. Louis were idle for over a week at a time. It was usually outside business that helped them at all. The country call was slight, but it was well ahead of the city demand. Transportation, of course, became good, but the carriers still persisted in keeping unreasonable orders in effect, which only served to add to the disappointment.

The year, which had opened under such favorable auspices for the coal industry, proved a disappointment at the close. To the right thinker, the disappointment was acceptable, for it was brought about chiefly through the ending of the war. To the trade this was the one big factor, and all interested parties were glad of the outcome, regardless of its effect on the coal industry. With the coming of a new year vanished the dreams of a great united industry in this section. This will not be brought about until there is a head to each part of the industry that every member can trust.



CAR DUMPING MACHINE OF THE PITTSBURGH, BESSEMER & LAKE ERIE R.R. AT CONNEAUT, OHIO

A Study of Shoveling as Applied to Mining—I*

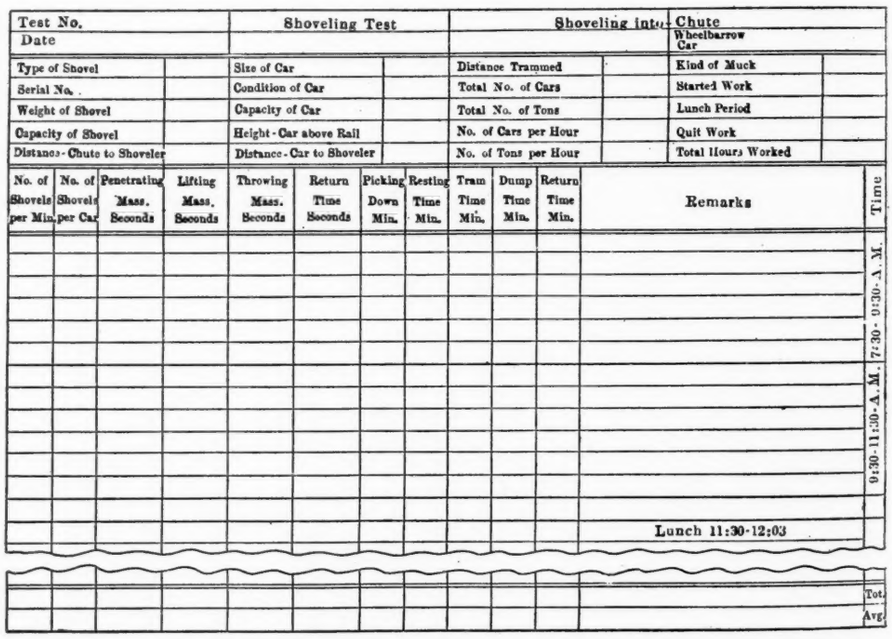
By G. TOWNSEND HARLEY
Tyrone, New Mexico

SYNOPSIS—*A series of tests was made to determine under what conditions a Mexican laborer would handle the greatest tonnage of muck in a given time, both underground and on the surface. Many factors influence the result, some of which are clearly set forth in this article.*

STOPING methods in which shoveling plays an important part are gradually being replaced by other and cheaper methods. But there will always be considerable shoveling done underground in stopes as well as in drifts, tunnels, winzes and shafts. At the mines of the Phelps-Dodge Corporation at Tyrone, N. M., the cost of shoveling in all stopes in 1917 amounted to 24c. per ton. In the top-slice stopes for the same period, it cost 27c. per ton, or 16 per cent. of the total cost of these stopes. The tonnage for shovelers from all stoping was 9.3 tons per man, and for top-slicing 8.2 tons per man. These stopes were not unduly hot, and there was not more than the usual amount of timber to interfere with the work of the men. The tonnages obtained per shoveler were considered low; first, because of a poor grade of Mexican labor, many of the men having come in from railroad grading camps; and second, because of a poor spacing of raises, especially in the top-slice stopes, where, in general, they were spaced 25 x 66 ft. centers. The average wage per laborer shift was $2.67 during the year. It was thought, however, that even under these conditions the men were not producing the tonnage that they should, so, with the consent of the management, the writer undertook to determine how the general efficiency of the underground shoveling could be improved. No predetermined plan for conducting these experiments was arranged, because we had no definite ideas as to the scope of the work or the number of elements into which the investigation would resolve itself, before all of its phases could be determined. We were sure, however, that any work that would thoroughly cover the ground would have to be in the nature of a systematic time study, combined with a course of instruction in correct shoveling methods and adequate and intelligent supervision of the work.

Two or three companies in the Southwest have done some work to determine the proper shovel to be used underground, but so far as is known the work has been limited to equipping certain parts of their mines with a particular type and size of shovel and thereafter watching the cost and efficiency records. In each case it seems to have been the shovel that held the 21-lb. load that gave the best results. Excepting personal communications from these companies, the only data available on scientific shoveling are contained in F. W. Taylor's book, "The Principles of Scientific Management," and D. J. Hauer's article, in *The Contractor* for Mar. 29, 1918, "A Hundred Hints for Shovelers."

This paper discusses and draws conclusions from several thousand time-study readings, taken both on the surface and in the mines for nearly a year. A sufficient number of readings were taken on each factor in the problem for the plotting of curves of the performances and to obtain accurate indices of the work to be expected from this class of labor. The work here described is not as complete in all of its details as we would like to have it, because we were forced to stop the work temporarily, owing to the number of men going into the national service, and our inability to get others who could make time studies. The results obtained so far, however, have been of such a startling nature that we have decided to submit them at this time, subject to future modification. It is hoped, also, that



Test No.				Shoveling Test				Shoveling into			Chute / Wheelbarrow / Car	
Date												
Type of Shovel				Size of Car				Distance Trammed			Kind of Muck	
Serial No.				Condition of Car				Total No. of Cars			Started Work	
Weight of Shovel				Capacity of Car				Total No. of Tons			Lunch Period	
Capacity of Shovel				Height - Car above Rail				No. of Cars per Hour			Quit Work	
Distance - Chute to Shoveler				Distance - Car to Shoveler				No. of Tons per Hour			Total Hours Worked	

No. of Shovels per Min.	No. of Shovels per Car	Penetrating Mass. Seconds	Lifting Mass. Seconds	Throwing Mass. Seconds	Return Time Seconds	Picking Down Min.	Resting Time Min.	Tram Time Min.	Dump Time Min.	Return Time Min.	Remarks	Time
												7:30 - 9:30 - A. M.
												9:30 - 11:30 - A. M.
											Lunch 11:30-12:03	
												Tot.
												Avg.

FIG. 1. TIME-STUDY SHEET USED IN THE TESTS

*First installment of a paper to be presented before the February meeting of the American Institute of Mining Engineers.

FIGS. 2 TO 4. PENETRATING MASS AND PREPARING TO THROW CONTENTS OF SHORT-HANDLED SHOVEL

Fig. 2—Position when starting to penetrate the mass. Fig. 3—Mass has been penetrated. Fig. 4—Position just prior to lifting shovel contents

a free discussion of this paper will lead to a disclosure of any errors that may have been embodied and offer some valuable suggestions for the conduct of future work.

As a first step, several weeks were spent underground making a general survey of the field and making time studies on various men, in order to see what points would need to be determined for a full consideration of the subject. The following factors are soon recognized:

1. The type, weight, size and design of shovel giving the greatest shift tonnage without too much wear and tear on the man would have to be determined. This work would also determine the point at which a shovel should be discarded as worn out.

2. A standard of comparison would be necessary if the ill effects of mine air, powder gas and smoke, temperature, humidity and poor light were to be estimated.

3. The layout and spacing of chutes would have to be studied with regard to their effect on shoveling directly into them, or loading into wheelbarrows or cars and tramming to them. This work would determine the proper distance at which shoveling into a chute should leave off and loading into a wheelbarrow or car be taken up. The information would also be of great use in planning the development of a stope.

4. Hindrances to work, such as timber standing in line of throw or closely spaced, men and supplies passing back and forth through working space, etc.

5. Manner of placing the shovelers to obtain maximum results from them, number of men in one working place, and size of working place required per man.

6. The hours of actual work and the cause and amount of delays, such as shoveler interrupted to help in other work, etc.

7. The capacity of a man for work as the day progresses.

TABLE I. WEIGHTS AND VOLUMES OF BROKEN ORE

Cubic Feet of Broken Ore per Ton	Pounds of Ore in 1 Cu.Ft.	Pounds of Ore in 1 Cu.In.	Cubic Inches of Ore in a 21-Lb. Load	Cubic Feet of Broken Ore per Ton	Pounds of Ore in 1 Cu.Ft.	Pounds of Ore in 1 Cu.In.	Cubic Inches of Ore in a 21-Lb. Load
10	200	0.1157	182	26	77	0.0446	471
11	182	0.1053	199	27	74	0.0428	491
12	167	0.0966	217	28	71	0.0411	511
13	154	0.0891	236	29	69	0.0399	526
14	143	0.0828	254	30	67	0.0388	541
15	133	0.0769	273	31	65	0.0376	558
16	125	0.0723	290	32	63	0.0365	575
17	118	0.0683	307	33	61	0.0353	595
18	111	0.0642	327	34	59	0.0341	616
19	105	0.0608	345	35	57	0.0329	638
20	100	0.0579	363	36	56	0.0324	648
21	95	0.0549	383	37	54	0.0313	671
22	91	0.0527	398	38	53	0.0307	684
23	87	0.0504	417	39	51	0.0295	712
24	83	0.0480	438	40	50	0.0289	727
25	80	0.0463	454				

8. Proper rest periods for men in order to maintain maximum efficiency.

9. Best means for instructing men and supervising work.

10. Payment received and manner of paying.

At the time this work was started, three types of shovels were in general use at the mines; a No. 2 scoop,

FIGS. 5 TO 7. LIFTING AND THROWING SHORT-HANDLED SHOVEL CONTENTS

Fig. 5—Shovelful has been lifted. Fig. 6—Preparing to throw shovel contents; a short step has been taken in direction of throw. Fig. 7—Contents have been thrown; note strained position in effort to throw a long distance with short-handled shovel

FIGS. 8 TO 10. PENETRATING MASS AND PREPARING TO THROW CONTENTS OF LONG-HANDLED SHOVEL

Fig. 8—Position when starting to penetrate mass with long-handled shovel. Fig. 9—Mass has been penetrated; note easy position of man. Fig. 10—Wrong way to start lifting; right foot and hand moved forward

used principally by contractors in development work, but favored also by a few of the shift bosses for use in the stopes; a No. 2 square-point D-handle shovel for shoveling off of a mat in the stopes; and a No. 2 round-point long-handle shovel, for scraping down a muck pile, shoveling off of a rough bottom, cleaning up, etc. The first task was to determine the average load that the various types and sizes of shovels would handle, in order to be able to determine whether the 21-lb. load, as advocated by Dr. Taylor, applied to underground work as well as to the surface work, and whether it was the best load for the average Mexican laborer of the Southwest.

TABLE II. CAPACITY IN CUBIC INCHES OF VARIOUS TYPES AND SIZES OF SHOVELS

Capacity in Cubic Inches	Size of Shovel — Blade, Inches — Width	Length	Square Point, Plain or Back Strap, Number	Round Point, Plain or Back Strap, Number	Scoop, Plain or Back Strap, Number	Scoop, Hollow Back, Number
249	9⅞	11⅞	...	2	.....	.....
278	10⅛	12⅛	...	3	.....	.....
302	9⅞	11⅞	2	...	.....	.....
308	10⅞	12⅜	...	4	.....	.....
340	10⅛	12⅛	3	...	.....	.....
340	11⅜	13⅛	...	5	.....	.....
363	10	13	*	...	.....	.....
373	10⅞	12⅜	4	...	.....	.....
384	11¼	13¼	...	6	.....	.....
414	11⅜	13⅛	5	...	.....	.....
446	11¼	13¼	6	...	.....	.....
457	11¼	15	...	...	2 E.P.	2 E.P.
521	11⅛	15½	...	...	3 E.P.	3 E.P.
564	11⅛	16½	...	...	4 E.P.	4 E.P.
579	12⅜	15½	...	...	1 W.P.	4 W.P.
622	12⅜	16½	...	...	5 E.P.	5 E.P.
633	13	16¼	...	...	2 W.P.	5 W.P
665	12⅞	16⅝	...	...	6 E.P.	6 E.P..
706	13⅛	17	...	...	7 E.P.	7 E.P.
721	13⅛	17	...	...	3 W.P.	6 W.P.
761	13⅛	17½	...	...	8 E.P.	8 E.P.
802	14¼	17⅝	...	...	4 W.P.	7 W.P.
832	14⅛	18	...	...	9 E.P.	9 E.P.
881	14⅝	18½	...	...	5 W.P.	8 W.P.
910	15⅛	18½	...	...	10 E.P.	10 E.P.
934	14⅝	19	...	...	6 W.P.	9 W.P.
1042	15⅛	19¾	...	...	12 E.P.	12 E.P.

* Specially made Test Shovel. E.P. = Eastern Pattern Scoop. W.P. = Western Pattern Scoop.

These average capacities were obtained by repeatedly shoveling a weighed pile of ore with each of the shovels and counting the number of shovel loads required to move it. Table I gives the number of cubic inches of ore in a 21-lb. load, for ore breaking to different volumes per ton; and Table II gives the sizes and types of shovels that will average up to any given content. Owing to the variety of conditions in underground shoveling, such as the material of which the shoveling platform is made, whether of wood, iron or natural bottom; the unsized material shoveled; and the amount of moisture in the ore, causing it to be sticky at times.

These average shovel capacities were found not to accord with actual practice, except over test periods of long duration; for short periods they would vary as much as ¾ lb. from the average, while single shovel loads would vary as much as 3 lb. For Burro Mountain are, the tables show that it requires a specially made shovel with a 10 x 13-in. blade to hold the 21-lb. load, or 363 cu.in. In practice, however, we are using at the present time a No. 4 square-point shovel holding 373 cu.in. and a No. 5 round-point shovel holding 340 cu.in. At this time also, a time study sheet, shown

FIGS. 11 TO 13. LIFTING AND THROWING LONG-HANDLED SHOVEL CONTENTS

Fig. 11—Shovelful has been lifted. Fig 12—Preparing to throw shovel contents; a short step has been taken in direction of throw. Fig. 13—Contents have been thrown; note ease of position as compared with Fig. 7

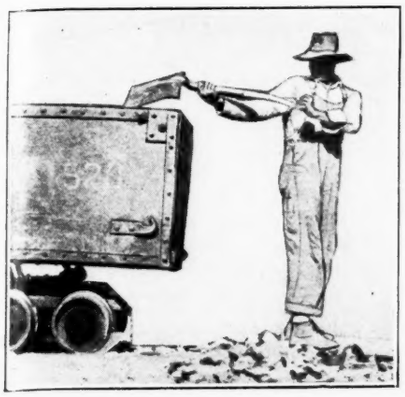


FIG. 14. CORRECT MANNER OF THROWING ORE INTO CAR
Car is only 4 ft. from top of ore pile

in Fig. 1, was developed that was used for all tests. In addition to the data placed on this sheet, an extensive log of the work was carried on. This undertook to explain, in detail, all delays, changes of work, rest periods, changes in conditions that would affect speed, high and low efficiency periods during the day, etc. Each night the study sheets and the log for the day were turned in at the office and the writer totaled, averaged and checked all readings, and entered them on special record sheets and charts in a convenient manner for comparison and study.

During the period of preliminary work, it was discovered that the work of a shoveler can be classified into the following divisions, each susceptible to comprehensive study and analysis, and to each of which can be given a definite relative time value.

Time spent actually shoveling, which may be divided into: Penetrating mass, lifting shovel contents, throwing shovel contents, and return to start of first motion.

Time spent picking down, considered as a rest.

Tramming and dumping time, with wheelbarrow or car.

Time spent resting, divided into: Definite rest periods and delays due to interferences, blasting, men and supplies passing, etc.

Time spent other than in shoveling was not counted in shoveling time. This included delays before starting to work, lunch period, quitting early at end of shift, and time spent on other work, helping machine man, timbermen, etc.

The motions listed are illustrated in Figs. 2 to 17. By studying each motion separately, it was possible to establish a standard time for each and, consequently, a standard of performance for the whole. It was possible, also, to discover which were the most tiring motions and how each was affected by length of time worked, length and distribution of rest periods, size of shovel, design of shovel, and length of throw. It was, of course, impossible to time all the motions made with any one shovelful; consequently these figures had to be obtained in rotation, each figure set down on the sheet being an average of 10 consecutive readings. For example, the day would be started by taking 10 readings of the number of shovels per minute and the average of these set down on the first line of the column of the time-study sheet. Ten readings would next be taken of the time for penetrating the mass, the average of which would be set down on the first line in the third column, and so on throughout the day. All delays and rest periods were timed and all wheelbarrow and car loads counted. As a check on the tonnage handled, a record was had of the number of shovelfuls making up a load, the average capacity of the shovel and of the wheelbarrow or car, an estimate was made of the tonnage in the original pile and, in many cases, the tonnage drawn out of the chute into which the man was shoveling or dumping the ore. At intervals during the day, a line was drawn across the time-study sheet, as in Fig. 1, and all subsequent readings were recorded below this line. This was done to watch the relative efficiency of the men at different times of day.

FIG. 15. PENETRATING MASS WITH HIGH-LIFT SHOVEL
Man not crouching as low as in Fig. 3

In order to obtain some standard of comparison for the underground work, some of the mine shovelers were brought to the surface and a record made of their work under ideal conditions; that is, with good air, good light, no timber to interfere, steady shoveling for various lengths of time, and standard lengths of throw for the muck. A platform was built on the side of the mine-

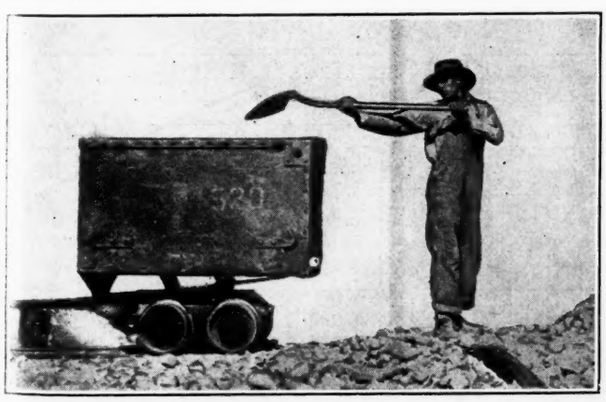


FIG. 16. CORRECT MANNER OF THROWING ORE INTO CAR WITH LONG-HANDLED SHOVEL
Car is 4 ft. from top of pile

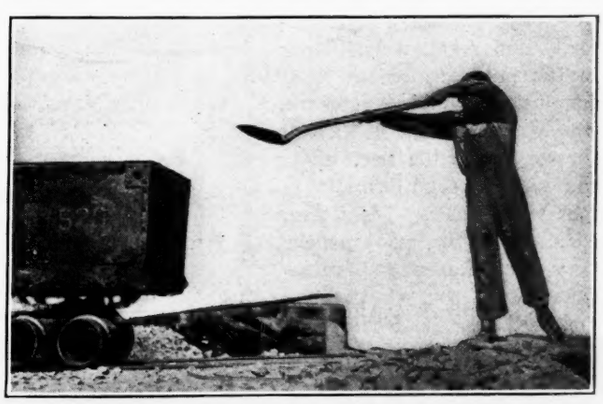


FIG. 17. SHOWING INCREASED EFFORT NECESSARY TO THROW ORE A LONG DISTANCE INTO CAR
Car is considerable distance from pile

waste dump, about 12 ft. below the year level, with a slide from the track above so arranged that no matter what quantity of muck was in the slide the toe of the pile was always in the same place on the platform and the shoveler did not have to move up as shoveling progressed. At several places on the platform trap doors were installed so as to obtain any desired length of throw into what corresponded to a chute in the mine. The muck thrown through these doors rolled down the side of the waste dump, out of the way, so that the opening was always clear. A track was laid along the side of the dump at the platform level, so that tests could be conducted in which the shoveler loaded

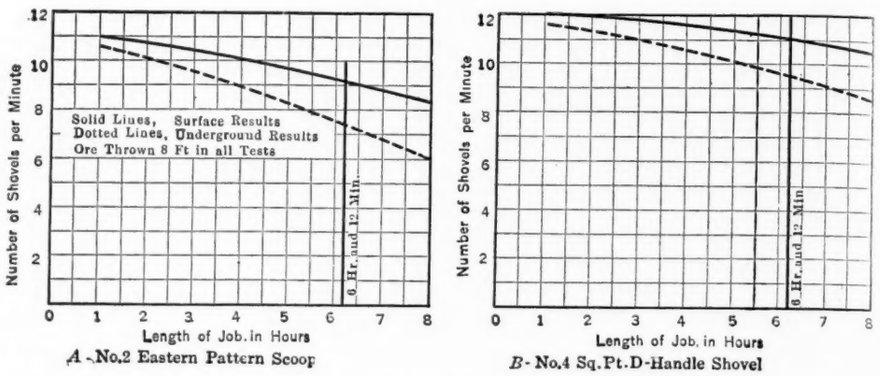

Number of Shovels per Minute
Solid Lines, Surface Results
Dotted Lines, Underground Results
Ore Thrown 8 Ft in all Tests
6 Hr. and 12 Min.
Length of Job, in Hours
A - No.2 Eastern Pattern Scoop
B - No.4 Sq. Pt. D-Handle Shovel

FIG. 18. EFFECT OF LENGTH OF JOB ON NUMBER OF SHOVELS PER MINUTE

came tired he was to take a few moments' rest, as it was better for him to rest at intervals than to try to work all the time, at the expense of speed and capacity. Later, we undertook to regulate the rest periods, to obtain the proper intervals at which

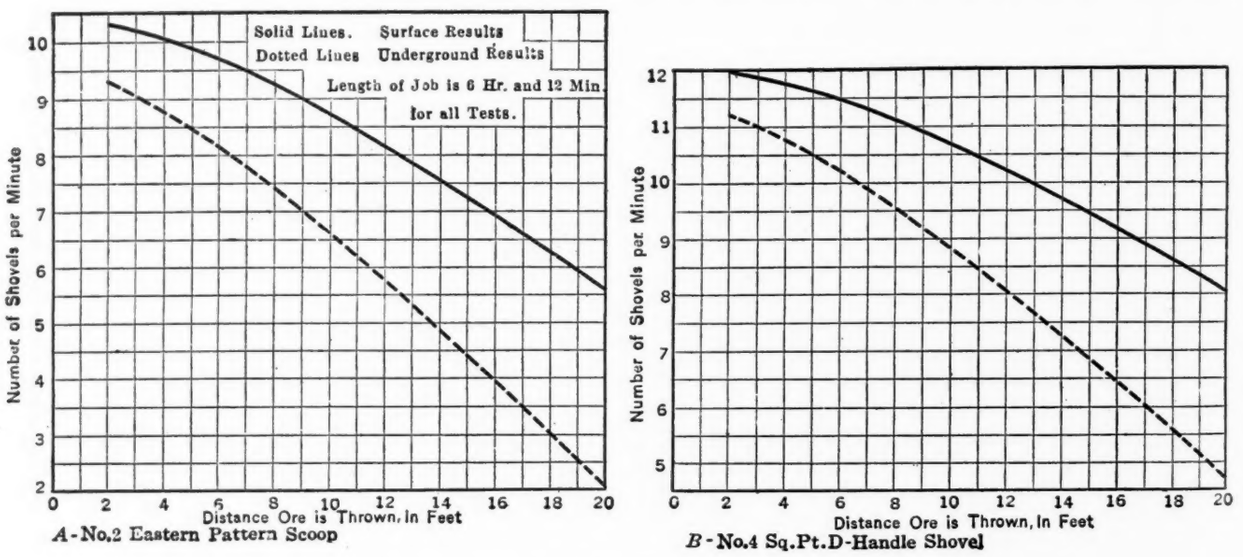

Number of Shovels per Minute
Solid Lines. Surface Results
Dotted Lines Underground Results
Length of Job is 6 Hr. and 12 Min.
for all Tests.
Distance Ore is Thrown, in Feet
A - No.2 Eastern Pattern Scoop
B - No.4 Sq. Pt. D-Handle Shovel

FIG. 19. EFFECT OF DISTANCE THROWN ON NUMBER OF SHOVELS PER MINUTE

the muck into a car, which he then had to tram a distance of about 100-ft., dump, and return to the muck pile again.

In addition to obtaining the comparison standard, it was possible to form some definite conclusions, which were later checked satisfactorily under actual conditions in the mine, as to the most advantageous size, type, weight and design of shovels for general mine use, under the various conditions to be met with there. Tests were carried on for two months, three different shovelers, taken from the mines, being observed. Each of these men was warned that he had to work at his best speed, all during the job, but that he was not to overtax himself. He was told that when he be-

they should occur, and their length. The results of these tests will be discussed in conjunction with the underground work.

All of the underground shoveling tests may be classified under one of three headings—shoveling directly

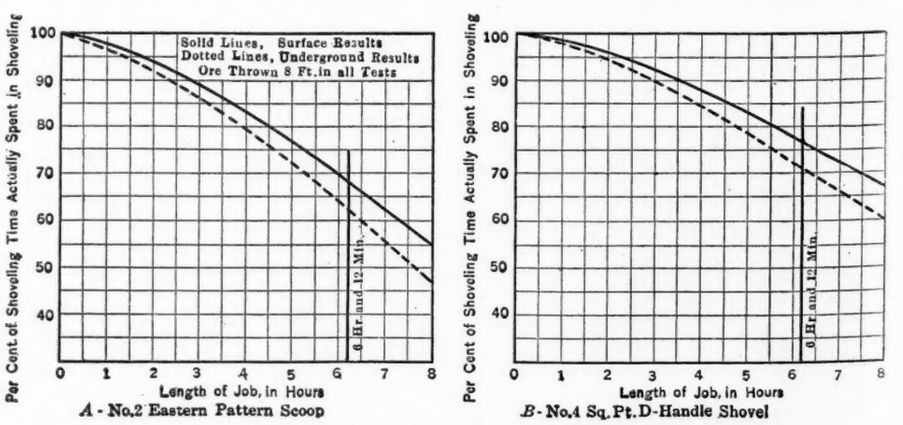

Per Cent of Shoveling Time Actually Spent in Shoveling
Solid Lines, Surface Results
Dotted Lines, Underground Results
Ore Thrown 8 Ft. in all Tests
6 Hr. and 12 Min.
Length of Job, in Hours
A - No.2 Eastern Pattern Scoop
B - No.4 Sq. Pt. D-Handle Shovel

FIG. 20. REST PERIOD REQUIRED FOR VARIOUS LENGTHS OF JOB

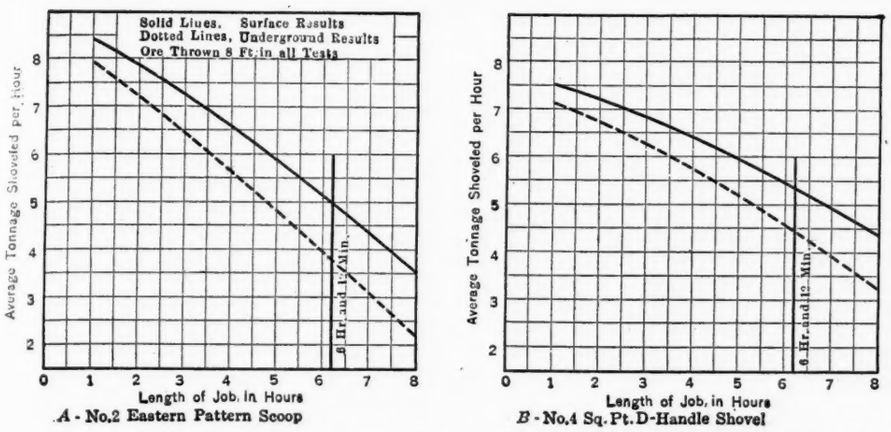

Solid Lines, Surface Results
Dotted Lines, Underground Results
Ore Thrown 8 Ft. in all Tests
Average Tonnage Shoveled per Hour
Length of Job, in Hours
6 Hr. and 12 Min.
A - No.2 Eastern Pattern Scoop
B - No.4 Sq. Pt. D-Handle Shovel

FIG. 21. AVERAGE TONNAGE SHOVELED PER HOUR FOR ANY LENGTH OF JOB

into chutes, shoveling into wheelbarrows and tramming to chutes, and shoveling into cars and tramming to chutes. Each of these series was conducted independently of the others, and was complete in itself. The men under observation worked for periods varying from 1 to 8 hours, and for each length of job they threw or trammed the muck over a wide range of distances, with various types and sizes of shovels. In all the underground tests the work was done under the actual mining conditions, with the one exception that the men were always under observation and consequently were working at a good speed for the full period of the test. In no case did the men overtax themselves, and we feel confident that all tonnages obtained and indicated on the charts are easily obtainable by a good, but not exceptional, Mexican laborer after he has been properly instructed, and under close and intelligent supervision, together with a wage paid in such a manner that he has a constant incentive to do good work.

It soon became evident that the great majority of shovels being tested were not suitable for efficient work, and although we continued to work with them to some extent, we have charted only the work of the No. 4 shovel, which handles the 21-lb. load, together with the No. 2 scoop, which was held in high esteem by many of the men in the operating department. In each of the charts of this series, Figs. 18 to 22, the results obtained during the surface tests are plotted alongside of corresponding results from underground, in order to accentuate the adverse effects of underground conditions on shoveling capacity. In Fig. 18 will be found the number of shovels per minute thrown into a chute at a distance of 8 ft. from the ore pile for jobs varying in length from 1 to 8 hours. In all of these charts, the length of job should be understood to mean the total working time, and when it is said that the length is 4 hours, the man was actually occupied at shoveling ore for 4 hours, and then his work was finished. All points on the curves are corrected averages for the time periods to which they correspond.

In connection with Fig. 18, the following facts will be noted: For all lengths of job, the number of shovels per minute is greater with the No. 4 shovel than with the No. 2 scoop. Both on the surface and underground, the speed of shoveling decreases more rapidly with the scoop than with the shovel, as the length of the job increases. A man working with a scoop underground can perform at only 72 per cent. of his speed on the surface for 8 hours, while with a No. 4 shovel, he can work at 82 per cent. of his surface speed. The percentage reduction in speed between surface and underground work is the measure, in part, of the effect of mine air, powder gas and smoke, temperature, humidity and poor light. Under the same condition of work, the difference in speed between the No. 4 shovel and the No. 2 scoop is due to the difference in the load handled. For short lengths of time, the difference in working speed between a scoop and a shovel is so small that, disregarding rest periods, the scoop is a slightly greater tonnage mover than the shovel; but for longer periods, the difference in speed is such that the shovel with its

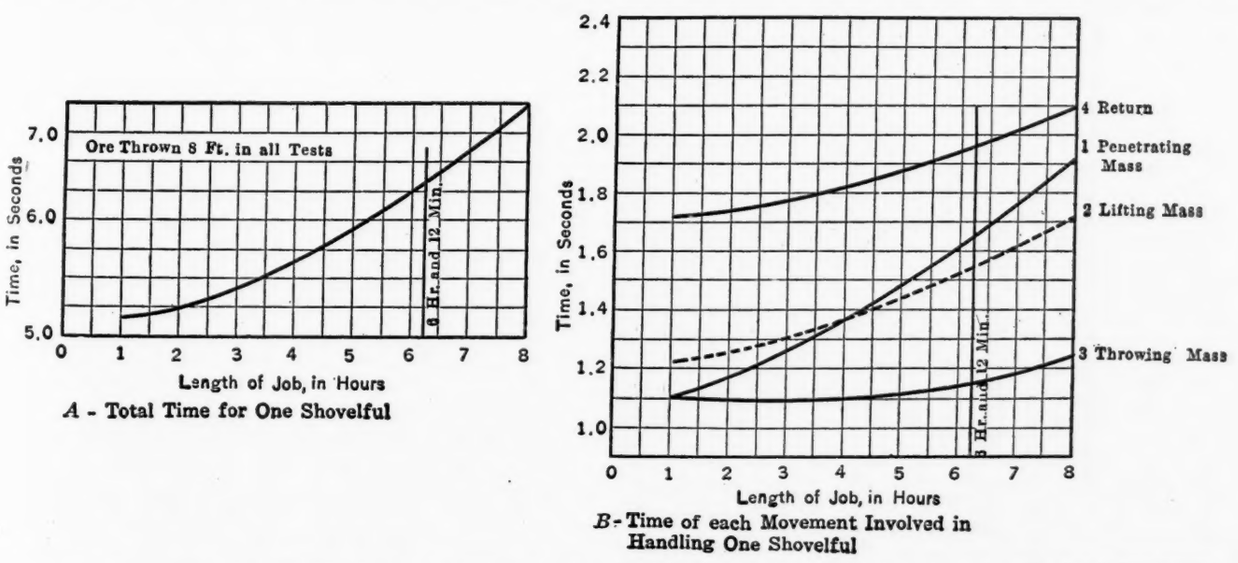

Ore Thrown 8 Ft. in all Tests
Time, in Seconds
Length of Job, in Hours
6 Hr. and 12 Min.
A - Total Time for One Shovelful
4 Return
1 Penetrating Mass
2 Lifting Mass
3 Throwing Mass
B - Time of each Movement Involved in Handling One Shovelful

FIG. 22. SHOWING TIME CONSUMED IN HANDLING ONE SHOVELFUL OF MUCK WITH NO. 4 SHOVEL UNDERGROUND

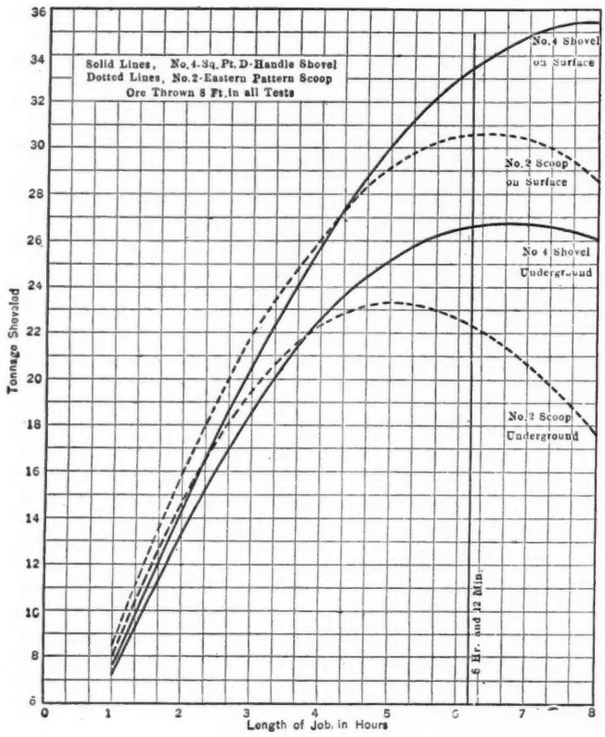

Solid Lines, No. 4-Sq. Ft. D-Handle Shovel
Dotted Lines, No. 2-Eastern Pattern Scoop
Ore Thrown 8 Ft. in all Tests
No. 4 Shovel on Surface
No. 2 Scoop on Surface
No. 4 Shovel Underground
No. 2 Scoop Underground
6 Hr. and 12 Min.
Tonnage Shoveled
Length of Job, in Hours

FIG. 23. COMPARISON OF WORK OF NO. 2 SCOOP AND NO. 4 SHOVEL

smaller capacity actually moves more muck than the scoop.

Fig. 19 indicates the manner in which the length of throw will affect the speed of the shoveler. These charts were worked out for a uniform length of job of 6 hours and 12 minutes, and for varying distances, as shown. The same relationship exists between the lines of these charts as on the charts of Fig. 18. The decrease in shoveling speed on the surface amounts to an average of 2.5 per cent. for every foot increase in distance thrown in the case of the scoop, and 1.8 per cent. for the No. 4 shovel. Underground, the working speed is decreased more rapidly, being respectively 4.4 per cent. and 3.2 per cent. per foot increase in throw. The rate of decrease, both on the surface and underground, is greater for the scoop than for the shovel.

To find the average shoveling speed for any length of job and for any distance that the ore has to be thrown, the number of shovels per minute for a throw of 8 ft. for the proper period, can be obtained from Fig. 18; this can be increased or diminished by the proper percentage obtained from Fig. 19, depending on whether the distance is less or greater than 8 ft. As an example, suppose that it is desired to determine how many shovels per minute a man will average, throwing a distance of 12 ft. for a length of a job of 6 hours, using a No. 4 shovel underground. Chart B, Fig. 18, shows that for 6 hours, throwing a distance of 8 ft., a man will average 9.6 shovels per minute. Chart B, Fig. 19, shows that to increase the length of throw from 8 ft. to 12 ft. diminishes the shoveling speed 15.7 per cent.; therefore for a 6-hour job, at 12 ft., the man will be expected to handle about 8.1 shovelfuls per minute.

Fig. 20 shows the amount of rest required for shoveling jobs of various lengths. Here again will be noted the same relations between lines that exist on the other charts in which times are given. The scoop again has a negative effect both on the surface and underground, causing a man to use up more time in resting than with a No. 4 shovel. The rest period, as considered here, is made up of the time consumed in delays, the time actually spent in resting, during which the man may smoke a cigarette and sit down for a few minutes, and the time used in loosening the muck pile, scraping up the dirt on the shoveling plat, or doing other light work; not actually shoveling, but closely related to it.

Over a long period it was possible to demonstrate the feasibility of accurately determining the percentage of the working day that a man will actually devote to shoveling. The working day at the Burro Mountain mines is 8 hours, one-half hour of which is given up to the lunch period, leaving 7½ hours as the total possible working time. It was found that of this 7½ hours, the man actually worked at shoveling for 82.5 per cent. of the time, or for 6 hours and 12 minutes, and on all the charts involving time, this particular length of job has been designated by a special line. The remainder of the possible working time, or 17.5 per cent., is spent on other work, quitting early for lunch or to leave the mine or commencing to work late at beginning of the shift or after lunch. Observations of this character

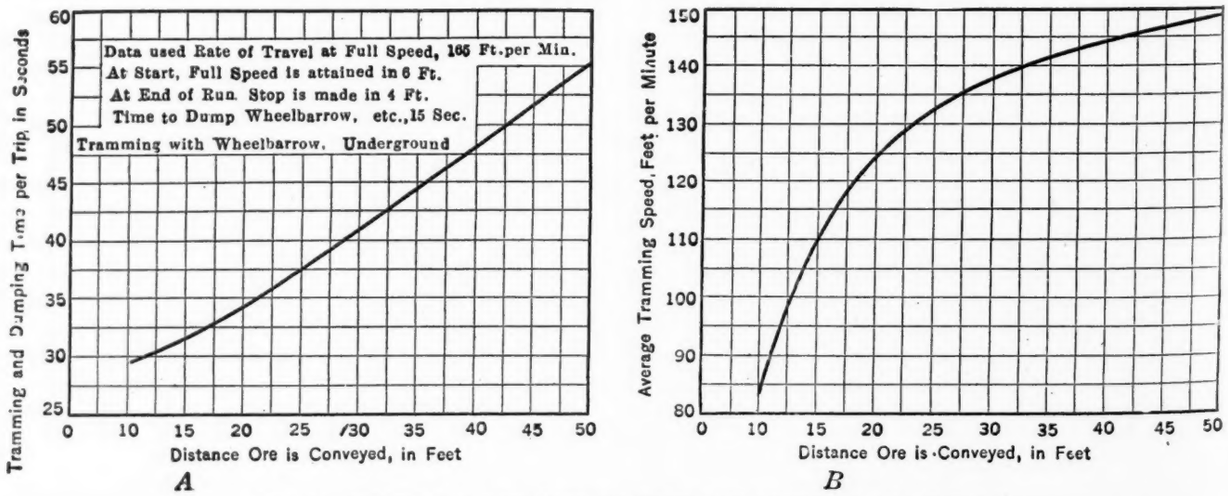

Data used Rate of Travel at Full Speed, 165 Ft. per Min.
At Start, Full Speed is attained in 6 Ft.
At End of Run Stop is made in 4 Ft.
Time to Dump Wheelbarrow, etc., 15 Sec.
Tramming with Wheelbarrow, Underground
Tramming and Dumping Time per Trip, in Seconds
Distance Ore is Conveyed, in Feet
A
Average Tramming Speed, Feet per Minute
Distance Ore is Conveyed, in Feet
B

FIG. 24. EFFECT OF DISTANCE ON TIME AND SPEED OF TRAMMING

were gathered by some of the shift bosses, on several hundred-man shifts, and it is surprising how little the figures obtained by each have varied from the average finally obtained.

Fig. 21 gives the average tonnage per hour to be expected of a man throwing the muck a distance of 8 ft. over any period of time; and Fig. 23 gives the total tonnage shoveled for any period, over the same distance. These graphs are corrected to agree with Figs. 18, 19 and 20, but as an illustration of how closely the actual results obtained agree with the charts, the following figures are presented: For a job lasting 5 hours and 30 minutes, with a No. 4 shovel underground, according to Fig. 23, a man would be expected to shovel 26.0 tons a distance of 8 ft. Five representative tests actually gave the following tonnages under average conditions:

Length of job 5 hours and 40 minutes, tonnage.....	28.0
Length of job 5 hours and 10 minutes, tonnage.....	23.0
Length of job 5 hours and 25 minutes, tonnage.....	26.0
Length of job 5 hours and 50 minutes, tonnage.....	34.0
Length of job 5 hours and 30 minutes, tonnage.....	25.0
Average, 5 hours and 30 minutes, tonnage average.....	27.4

Fig. 22 shows how the time of shoveling one shovelful of ore is influenced by the length of the job, with the length of throw remaining constant. In Chart B, the total time of handling one shovelful of muck has been divided into its component movements. The lines representing the work of penetrating mass, lifting shovelful, and return, show a constant increase as the length of job increases. The actual increase in the time of each movement is not due so much, it is thought, to a decrease in the speed of making the move, which probably is fairly constant, as it is to an ever-increasing period of rest taken at the beginning and end of each movement, which, however, was too short to be accurately timed. Throwing the mass in the shovel is not influenced as much as the other moves, as the muck must be thrown along a definite path, which is limited to distance and height, and hence a constant speed must be maintained to carry it over.

The reader will be well repaid by a careful study of Fig. 23, and the following points should be noted:

1. The difference in tonnage handled by the same shovel, on the surface and underground, for any length of job, is the measure of the bad effects of underground conditions. For a job of 6 hours and 12 minutes, with a No. 4 shovel, the underground work is 20.5 per cent. less than on the surface.

2. The difference between the amounts shoveled with the No. 2 scoop and the No. 4 shovel, under same conditions, is the measure of the effect of the difference in load handled by the man.

3. Each line on this chart shows a peak at some particular length of job, and the total tonnage shoveled for

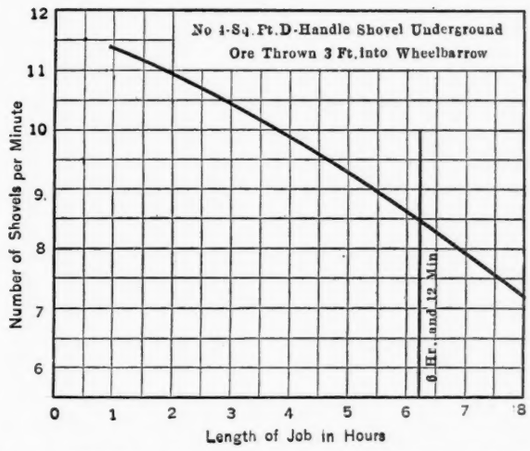

No 4-Sq.Pt.D-Handle Shovel Underground
Ore Thrown 3 Ft.into Wheelbarrow
Number of Shovels per Minute
6 Hr. and 12 Min
Length of Job in Hours

FIG. 25. EFFECT OF LENGTH OF JOB ON NUMBER OF SHOVELS PER MINUTE

any greater period than this is actually less. The point at which this peak occurs should be termed the "economic shoveling day," and a company should not require its men to work at shoveling any longer than this, except in emergency cases.

4. The presence of this peak accords with the experience of many superintendents and managers, who state that their men do more work in an 8-hour day, than they did on an old 10-hour basis.

5. The "economic shoveling day" is about 6⅔ hours, with a No. 2 scoop on the surface, and 5⅓ hours underground. With a No. 4 shovel, on the surface 8 hours is about the proper length of day, while underground 6⅔ hours seems to be about correct. As the men actually shovel only 6⅓ hours per day on an average and as their other work is generally of a light nature, the 8-hour day with the correctly proportioned shovel is probably the best; but with a scoop it is certainly too long.

6. For work on the surface, on jobs lasting longer than 4⅔ hours, the No. 4 shovel is superior to the scoop. Underground the No. 4 shovel demonstrates its superi-

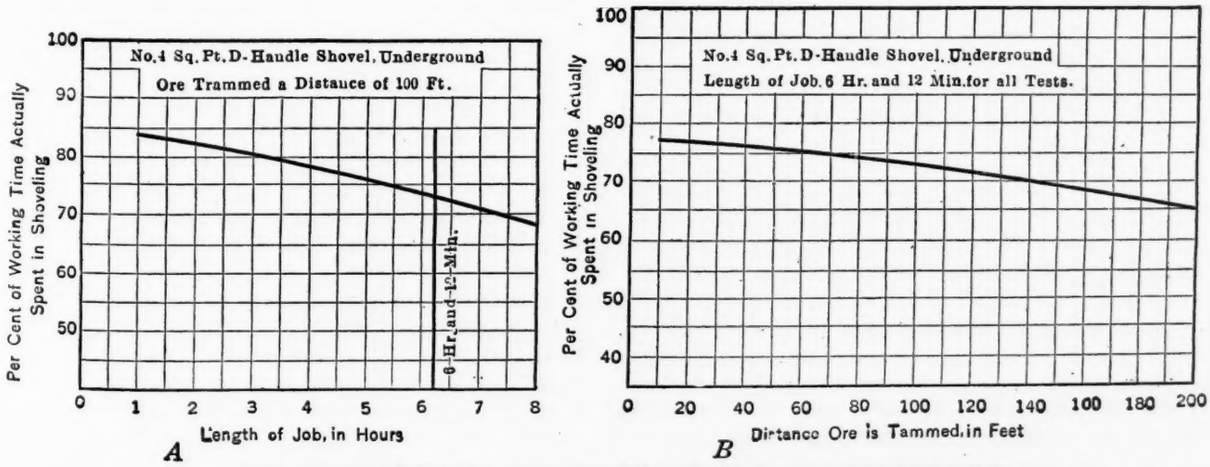

No.4 Sq.Pt.D-Handle Shovel, Underground
Ore Trammed a Distance of 100 Ft.
Per Cent of Working Time Actually Spent in Shoveling
6 Hr.and 12 Min.
Length of Job, in Hours
A
No.4 Sq.Pt.D-Handle Shovel, Underground
Length of Job 6 Hr. and 12 Min.for all Tests.
Per Cent of Working Time Actually Spent in Shoveling
Distance Ore is Tammed, in Feet
B

FIG. 26. REST PERIOD REQUIRED FOR VARIOUS CONDITIONS OF WORK

ority for jobs longer than $3\frac{2}{3}$ hours. The scoop then may be considered as a task shovel for short-time jobs, but even here, its value is only slightly greater than the No. 4 shovel, besides tiring the man so that he is unfit for other work when the shoveling task is finished. There is also the additional danger of having some men continually trying to use the scoop for the full shift, thinking that the amount of work (and hence the amount of pay in the case of contract and bonus systems) is greater as the size of the shovel increases.

The following formulas show the manner in which use is made of the figures presented in the preceding diagrams:

Let W = Weight of load on shovel, in pounds;
N = Number of shovels per minute, Figs. 18 and 19;
P = Per cent. of time actually shoveling, Fig. 20;
L = Length of job, in minutes;
T = Total tonnage shoveled;
n = Number of shovels per minute for an 8-ft. throw, Fig. 18;
p = Per cent. increase or decrease due to various lengths of throw, Fig. 19.

Then

$$\frac{W \times N \times P \times L}{2000} = T \qquad n = N(1.00 \pm p)$$

Example 1.—What will be the total tonnage handled, using a 21-lb.-load shovel, throwing the ore 8 ft., underground, for a job of 5 hours duration? Chart B, Fig. 18, shows that for 5 hours a man with average 10.1 shovels per minute, and Chart B, Fig. 20, shows that he will actually shovel 79 per cent. of the 5 hour period, therefore:

$$\frac{21 \times 10.1 \times 0.79 \times 300}{2000} = 25.1 \text{ tons}$$

Example 2.—What will be the total tonnage handled, using a 21-lb. load shovel, throwing the ore 15 ft. underground, for a job of 6 hours duration? Chart B, Fig. 18, shows that for 6 hours a man will throw a distance of 8 ft. at the rate of 9.6 shovels per minute. Chart B, Fig. 19, shows that increasing the distance to 15 ft. reduces the capacity by 27.4 per cent., therefore:

$$N = n\,(1.00 \pm p) = 9.6\,(1.00 - 0.274) = 7;$$

hence,

$$\frac{21 \times 7.0 \times 0.79 \times 360}{2000} = 19.3 \text{ tons}$$

Shoveling Into a Wheelbarrow

The charts presented in the series, Figs. 25 to 27, follow as closely as possible the series just discussed, but offer only the results obtained with the No. 4 D-handle shovel. It was soon discovered that a throw of 3 ft. to the wheelbarrow gave the best results so far as number of shovels per minute and rest periods required were concerned, and in all subsequent work the ore was thrown into the wheelbarrow from this distance. It will be noted that, in Fig. 25, for any length of job, the number of shovels per minute is less than when throwing 8 ft. into a chute; this is due to the fact that the shoveler must place each shovelful carefully to keep the wheelbarrow from spilling its contents and to make it ride easily.

Chart A, Fig. 24, shows the length of time consumed in tramming and dumping a wheelbarrow over any distance, and Chart B shows the average tramming speed developed for any distance. For this chart, careful determinations were made of the distance in which it takes a man to acquire full speed and the distance in which, after having attained full speed, he can make his stop. The full-speed rate of travel in stopes will average 165 ft. per minute. The wheelbarrow in use is the No. 7, which holds 3 cu.ft. and stands 21 in. above the floor at the point of maximum height. The maximum load in a wheelbarrow should be about 300 lb. as larger loads are too exhausting, and lighter loads consume too much time in tramming and dumping.

Chart A, Fig. 26, shows the per cent. of time a man will work during any given working period, the length of tram in each case being 20 ft. The rest period is practically a constant proportion of any length of job, as that part of the tramming time in which the man brings the empty wheelbarrow back to the ore pile is virtually a rest period. For long trams, the work of tramming the loaded barrow is so heavy that a greater

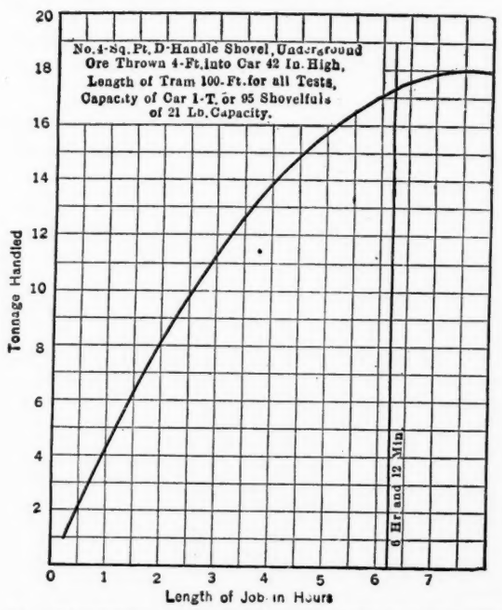


FIG. 27. SHOWING CAPACITY OF A SHOVELER USING A WHEELBARROW FOR VARIOUS JOBS

rest is required than is obtained on the return, and Chart B shows how the rest period increases for a constant length of job, as the length of tram increases.

Fig. 27 shows the tonnage to be expected of a man, based on Figs. 24 to 26, for any length of job, the length of tram being constant at 20 ft. This chart shows that the shoveler has not quite reached his maximum capacity at the end of 8 hours. Two reasons are advanced for this: (1) As long as a man can throw the ore into a chute, he has a fairly direct throw from the ore pile to the chute, and with a car he has a definite path to traverse each trip. With a wheelbarrow, however, the direction and length of tram are constantly varying, as is also the amount of interference from other trammers, timbermen, machine men, etc. The retarding influence of these factors increases as the length of the tram increases. (2) The sequence of operations, shoveling, tramming, dumping, etc., is of such short duration and changes so often from one to the other that it is hard to keep up any pace that may be set and probably an unnecessary amount of rest is indulged in for all periods.

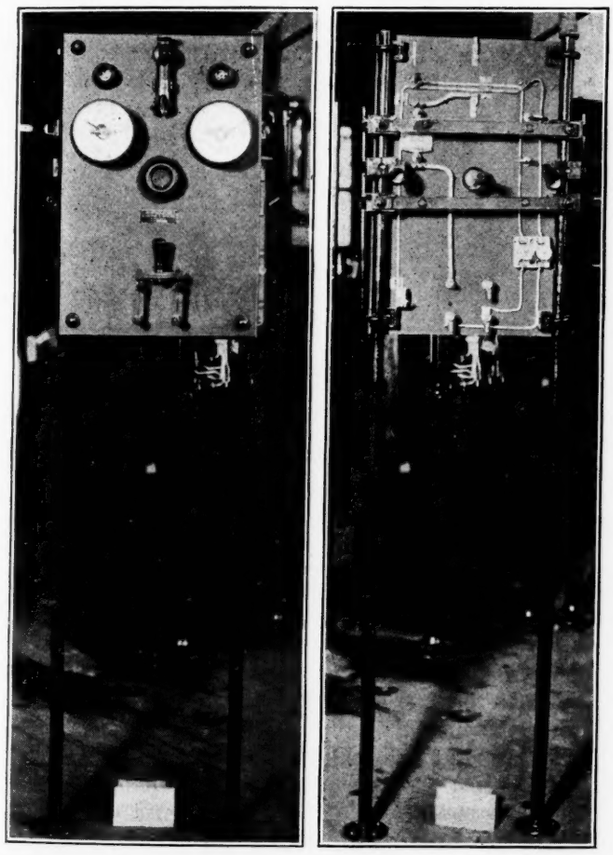
(To be concluded)

There are some indications that volatile combustible containing a high percentage of oxygen is harder to burn than one containing little oxygen. Whether the difficulty in burning it is due to the oxygen content or to some other chemical property can not be stated definitely.—*Bureau of Mines Bulletin No. 135.*

NEW APPARATUS AND EQUIPMENT

Ready-to-Wear Switchboards for Small Installations

The switchboards shown in the accompanying illustration, known as the Westinghouse "ready-to-wear" type, are each suitable for the control of a direct-current generator and three lighting circuits. They are particularly adapted to the smaller installations. One advantageous feature of this type of switchboard is that it can be placed in operation by simply connecting the leads from the generator and feeder circuits to the terminals provided for that purpose. This is in marked contrast with the expense entailed in the purchase of meters, switches, circuit-breakers, slate slabs, framework and the work of designing and assembling the complete panel on the job.



TWO VIEWS OF THE "READY-TO-WEAR" SWITCHBOARD

The installation of the old types of switchboard involved much detail work. First of all each piece of apparatus had to be ordered with careful consideration given to the type and capacity. Drilling templets of each must be secured and a considerable sum must be allowed to cover investment in machines and tools for drilling the slate and bending the copper strap connections. Finally, when the panel was built up and installed, it might operate and it may look pretty good, but one could never be absolutely certain of this from the start.

The accompanying illustration is typical of the types K.D. and J.D. panels, both of which are suitable for 125 and 250 volts in capacity up to 600 amp. They are manufactured by the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Penn. Both these types of panels permit a choice in the number and capacity of feeder circuits.

Flexible Quick-Make and Quick-Break Motor-Starting Switch

One of the new pieces of equipment brought out by the Westinghouse Electric and Manufacturing Co. during the past year is an interesting starting switch. This switch is designed for use where squirrel-cage motors are started with a full line voltage. It is known as the quick-make (and quick-break) starting switch, type 816. Its characteristics are 10 to 100 amp., 25 hp. maximum, three-phase, 220, 440 and 550 volts.

This switch is extremely flexible in application. In addition to being a motor starting switch, it can also be used to control feeder circuits; it may be supplied in any of the following combinations, each having the "quick-make and quick-break" feature, for either hand or shipper-rod operation: (a) Nonautomatic switch, (b) switch with low-voltage protection, (c) switch with inverse time element overload protection, (d) full automatic switch with low-voltage and inverse time element overload protection.

The switch is especially suitable for shipper-rod operation on account of the positive action of the contacts. It is impossible for the operator to retard the motion of the contacts after they have started to close—here can be no "teasing" of the contacts. Workmen who are accustomed to starting machines from line shafting by means of shifting belts have no confusing details to learn. They can start the motor-driven machine with the same starting motion they use in shifting belts.

The contacts are opened and closed in oil, thus effectually suppressing arcing. The contact is made or broken so quickly that the eye cannot follow the motion. A rolling action confines the arc to the tips of the contacts and prevents pitting or roughening of the seating parts where final contact is made. A strong spring holds the contacts firmly in the closed position. These features result in greatly prolonged life for the contacts.

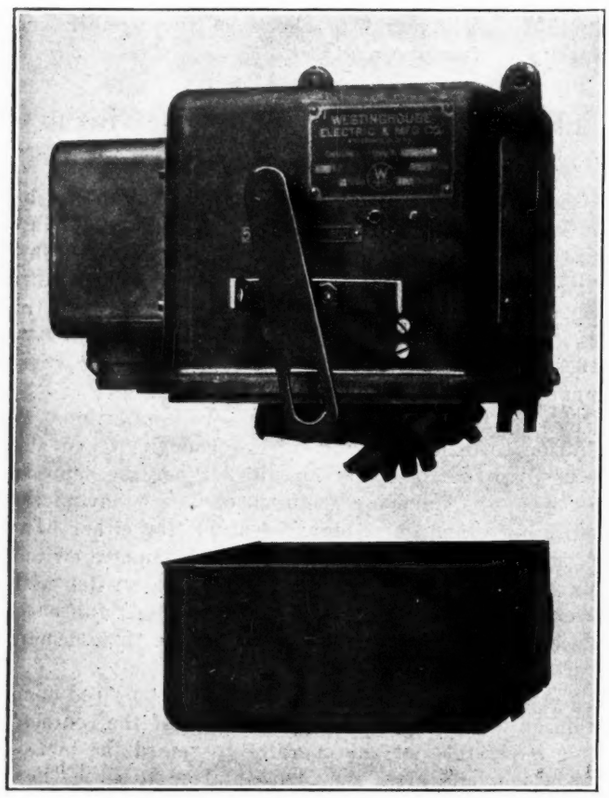
Drawn-steel construction is employed, giving maximum strength with light weight, and assuring uniformity and interchangeability when new parts are needed for replacement or repairs. The oil tank is supported by snap ring-latches. Removal of the tank clearly exposes the contacts and makes them easily accessible. When necessary to replace contacts each may be removed by taking out a single screw.

Contacts and contact supports are of the same construction used for Westinghouse Type A auto-starters and magnetic contactors. This minimizes the number of spare parts that should be carried.

These starting switches are dust-proof. Openings are provided for conduit wiring into the top of the case; terminals for connecting motor and line wires are accessible when the cover at the top of starter is removed.

Micarta insulation is used throughout. Overload and low-voltage attachments may be added with no change to the switch mechanism, as the toggle trip is common to all combinations of this switch.

The low-voltage protection not only opens the contacts on failure of power, but makes it impossible to close



STARTING SWITCH AND REMOVABLE COVER

them again until a return of voltage. Since the low-voltage coil is connected in the line circuit continuously, means have been provided to close the armature of the low-voltage circuit when the switch is in the "off" position, thereby giving protection to the coil and preventing burn-outs. A safety stop may be provided by connecting one or more push buttons in series with the low-voltage coil.

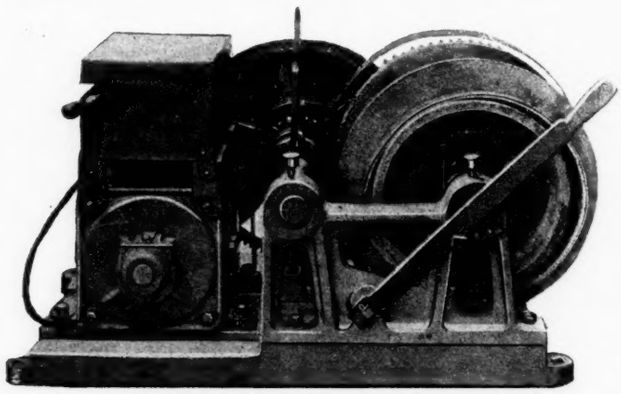
The overload relay is the same as that used on Westinghouse Type A auto-starters. It has the inverse time element feature and is equipped with a regulating device, adjustment of which controls the degree and duration of the overload possible on a motor or feeder circuit. This adjustment can be made without opening the switch cover.

The hand reset is an additional safety feature which makes it necessary to set the mechanism before the switch contacts can be closed. Whether the contacts have been opened through the operation of the low-voltage coil, the overload relay, or by moving the switch handle to the "off" position, it is impossible to close them again until the switch handle has been moved to the "reset" position. Thus protection is afforded workmen and valuable machinery which might be injured by accidental starting of the motor.

New Room Hoist Has Three-Jawed Clutch Instead of Sliding Pinion

The Flood City Manufacturing Co. will shortly place upon the market an improved type of room hoist, facilities for the manufacture of these machines having been about completed. These machines will be built in 3, 5, and 10-hp. capacity. All gears will be cut, the main gear being securely bolted to the hoist drum. This construction insures a certain economy since if, say, the gear is broken or its teeth stripped, it is unnecessary to buy a complete gear and drum, as would be the case if these parts were cast integral.

The bearings of this machine are equipped with interchangeable bronze bushings—that is, one size of



IMPROVED TYPE OF ROOM HOIST

bushing will fit any bearing on the machine. This reduces the number of spares necessarily carried.

An important feature of this hoist is the substitution of a three-jawed tapered clutch in lieu of a sliding pinion, thus obviating the liability of stripping gears when inserting the clutch while the motor is in operation or the current is turned on.

The machines are compact and may be moved easily from place to place about the mine. Equipped with a 5-hp. G.E. motor, one of these hoists will coil 300 ft. of ½-in. rope upon its drum and, if necessary, it may be designed to accommodate greater lengths. With the motor operating at a speed of 910 r.p.m., the average rope speed is 140 ft. per minute, while a rope pull of 1200 lb. is developed.

Allowing a car resistance of 30 lb. per ton, this 5-hp. hoist will handle the following loads:

Level	40 tons
1 per cent. grade	24 tons
2 per cent. grade	17 tons
3 per cent. grade	13 tons
4 per cent. grade	11 tons
5 per cent. grade	9½ tons
6 per cent. grade	8 tons
10 per cent. grade	6 tons
15 per cent. grade	4 tons

The manufacturers of this machine have had a number of them in operation in various bituminous mines, and the reports thus far received concerning their durability and utility are decidedly favorable.

Fuel Administration Activities Now a Thing of the Past

The large Fuel Administration building is almost deserted. Cyrus Garnsey, the assistant fuel administrator, continues to observe regular office hours each day, as do some of the heads of bureaus. The bustle, which was once so characteristic throughout the extensive structure, is gone. The outer offices, which for more that a year were crowded all day long with operators and others interested in the industry, waiting to present their particular cases, rarely are used now. There is no congestion of callers. Such little work as there is to be done generally is performed in a few hours each day, but it is mandatory until the actual signing of peace to continue to maintain the skeleton of the organization.

Preparations Almost Completed for Lignite Treatment Investigations

Plans are being completed by the Bureau of Mines to take up promptly the lignite investigation for which Congress just has authorized the expenditure of $100,000. A survey is being made to determine the location of a plant at a point where the chances of success are greatest. It is practically certain, however, that the plant will be located in the Texas or the North Dakota field. Other deposits of lignite are obviously less suited for experimental purposes.

Only incidental attention is to be given the secondary products of the beneficiated lignite. All the major efforts are to be concentrated on obtaining a solid fuel and a gas fuel. It is realized that once it is demonstrated that lignite is susceptible to treatment which will produce a desirable fuel a a cost permitting of profit for private enterprise, the principal purpose of the investigation will have been accomplished. The matter of developing byproducts would go ahead rapidly once a profitable industry had been established.

It is the object to gather together at a single small demonstration plant those elements that have apparently been successful in the work that has already been done in efforts to utilize lignite. Care will be taken not to dilute the effort by extending it beyond the plant which it is expected to operate.

The work will be under the general supervision of O. P. Hood, the chief mechanical engineer of the Bureau of Mines, and under the immediate charge of S. M. Darling.

Former Railroad Head Recounts Difficulties of Handling Coal and Coke

Reviewing the work of the operating division of the Railroad Administration for the year 1918, W. G. McAdoo makes the following reference to the handling of coal and coke:

One of the heaviest tasks for the railroads during the past year has been in providing necessary transportation for fuel. This has only been accomplished by effective cooperation between the Fuel Administration and the Railroad Administration. It has been necessary to adopt extraordinary measures, and these as a rule have been cheerfully met by shippers, whose rights were at times very considerably affected. Foremost among these measures was the joint action of the two administrations in zoning the distribution of bituminous coal, the purpose being to avoid waste of transportation by prohibiting unduly long hauls to destinations which could otherwise be served and especially where such prohibition avoided the cross hauling heretofore prevailing to a considerable degree. The effect of this zoning has been to assign to each of the producing districts a certain fixed area within which to market its coal, any shipments outside of this area to be made only by permit of the Fuel Administration.

Another factor which worked advantageously in the interest of fuel production was the establishment of the Eastern Railroads Coal Car Pool for handling the coal cars owned by railroads in the eastern section of the country. This pool was created just prior to Federal control, but its administration since Jan. 1, 1918, has been under the direction of the car service section. This method of handling coal cars has some objections, but unquestionably has been very helpful in providing an increased car supply for the production of coal.

Two of the individual coal problems of the country are those of supplying the coal needs of New England and the Northwestern States, the latter from the upper lake docks. The New England movement must of necessity be handled largely by ocean, and this was made difficult in the early part of the year by the lack of shipping. By coöperation with the Shipping Board this difficulty was overcome and by the end of September the New England program, both all-rail and ocean, was so far met that the administrator for that district was unable to absorb coal as rapidly as it was being shipped, and toward the end of October requirements for the year were reduced. The coal for the Northwest must of necessity be handled during the season of open navigation on the Great Lakes, and the program of the Fuel Administration this year has been fully accomplished with less demand for equipment than ever before and practically no congestion of movement.

The foundation of successful operation in the steel industry lies in an adequate supply of coke, byproduct coal and steam coal. Every effort had been made during the year to maintain adequate supply of these fuels at such plants, and it is a matter of record at the War Industries Board that practically all of the transportation needs of coke, byproduct coal, and fuel coal for the steel industries have been promptly and adequately met.

A step of much importance was taken by the establishment of uniform rules for rating of coal mines by which car supply is directed. These were made effective as of Oct. 10, 1918. Previously roads were using different methods and with varying interpretations. On the uniform basis which now obtains a more equitable distribution of cars as between districts, railroads, and mines is possible than heretofore.

A factor which has an important bearing on the question of coal-car supply is the extent to which this type of equipment is used in handling stone, sand, and gravel for construction and road-building purposes, and curtailment of such noncoal use has been necessary. Cheerful coöperation and assistance has been received from all shippers thus adversely affected.

Senate Manufacturing Committee Has Given Up Anthracite Investigation

Temporarily the Senate Manufacturing Committee has given up the investigation of the anthracite coal situation, though Senator Vardaman is in receipt of many telegrams saying that the temporary suspension of operations in the hard coal industry was unwarranted and unjustified.

Senator Vardaman proposes to make a quiet investigation of his own, and if he finds any truth in the accusations he intends to call those responsible to account. Some of these telegrams contain the most absurd statements imaginable, such as there is plenty of empty cars; that the lull in the coal trade is but temporary; that it is the evident intention of the coal companies to continue the scarcity in order to maintain the present prices, and that the coal companies should make every effort to continue operations, so as to avoid unemployment.

Senator Vardaman would have it understood that he is not through with the other investigation either. He proposes to call in the immediate future several independent operators, some miners and a few coal dealers. He could not say just when the hearing would begin, but he thought it would be in the near future.

Railroads Carry Out Less Than Half Their Program for Improvement

Less than half of the Railroad Administration's program for improvement of the roads last year was carried out. Of the $1,218,960,000 authorized capital expenditures for leading lines only $573,334,000 was spent, according to an administration report, including an estimate for December.

For additions and betterments to tracks and property $265,931,000 was spent, and for cars and locomotives $289,388,000. Of the latter amount the railroad companies individually spent $171,872,000 and the Railroad Administration $117,516,000. Only $18,000,000 was expended on new lines and extensions.

Among the larger capital expenditure items by individual railroads were the following: Pennsylvania lines east, $54,037,000; Pennsylvania lines west, $11,765,000; New York Central, $38,421,000; Santa Fé, $22,385,000; Illinois Central, $24,830,000.

A coöperative arrangement has been made between the Geological Survey and C. A. Allen, the state mine inspector of Utah, for uniform collection of coal figures and for the sending out of joint questionnaires.

Research Graduate Assistantships at University of Illinois

To assist in the conduct of engineering research and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains fourteen Research Graduate Assistantships in the Engineering Experiment Station. Two other such assistantships have been established under the patronage of the Illinois Gas Association. These assistantships, for each of which there is an annual stipend of $500 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics or applied chemistry.

An appointment to the position of Research Graduate Assistant is made and must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred. Not more than half of the time of a Research Graduate Assistant is required in connection with the work of the department to which he is assigned, the remainder being available for graduate study.

Nominations to these positions, accompanied by assignments to special departments of the Engineering Experiment Station, are made from applications received by the Director of the Station each year not later than the first day of March. The nominations are made by the Executive Staff of the Station, subject to the approval of the President of the University. Nominations are based upon the character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself. Preference is given those applicants who have had some practical engineering experience following the completion of their undergraduate work. Appointments are made in the spring, and they become effective the first day of the following September. Vacancies may be filled by similar nominations and appointments at other times.

The Engineering Experiment Station, an organization within the College of Engineering, was established in 1903 for the purpose of conducting investigations in the various branches of engineering, and for the study of problems of importance to engineers and to the manufacturing and industrial interests of the State of Illinois. Research work and graduate study may be undertaken in architecture, architectural engineering, ceramic engineering, chemistry, civil engineering, electrical engineering, mechanical engineering, mining engineering, municipal and sanitary engineering, physics, railway engineering and theoretical and applied mechanics.

The work of the Engineering Experiment Station is closely related to that of the College of Engineering, and the Heads of Departments in the College constitute the Executive Staff of the Station. Investigations are carried on by members of the Station staff and also by members of the instructional staff of the College of Engineering.

Additional information may be obtained by addressing the director of the Engineering Experiment Station of the University of Illinois, at Urbana, Illinois.

THE LABOR SITUATION

EDITED BY R. DAWSON HALL

General Labor Review

At length the official result of the election of Dec. 10, 1918, is received, the international tellers having reached a final tally. Frank J. Hayes is reëlected president with 114,355 votes as against 88,507½ cast for John H. Walker. The other offices voted for with the votes recorded are as follows: For vice president — John L. Lewis, 131,798½; Thomas Kennedy, 66,458. For secretary-treasurer—William Green, 144,642; J. L. Sims, 50,336. It will be seen that both Lewis and Green are reëlected.

The time for new contracts is when the war comes to an end or on Apr. 1, 1920, should peace not be declared by that time. Unfortunately the New River and Winding Gulf mine workers want a new scale Apr. 1, 1919, and they advocate a conference during February and March. The old contract undoubtedly requires a meeting 60 days before renewal, but the new contract, being based on a date not known in advance, it is hard to see how a conference can be held, except fortuitously, even approximately 60 days before that date.

The operators are willing to go on paying the present wage rates and think that with the market as it is the mine worker should be satisfied and he certainly should. The decisions of Special Umpire Allison O. Smith of the United States Fuel Administration, as just reported, have all been favorable to the mine workers, so they have not even this cause for dissatisfaction.

Union Cannot Ask Disposition of Fund Not Contemplated by Testator

An old fund, established 40 years ago by Franklin B. McGowan, of the Philadelphia & Reading Coal and Iron Co., for the benefit of employees of that company, ceased operation when the compensation law came into effect. The United Mine Workers of America, District No. 9, want it reëstablished and made operative for the benefit of orphans all over the district.

As this is contrary to the wish and intention of the testator it is not unnatural that the trustees, who would be liable for a breach of trust, declare that they are not disposed to grant what is asked of them. President James Matthews, of District No. 9, and other officials of the same district, fully recognize, apparently, the justice of the statement of the trustees. They understand that, while the trustees would be glad to use the money to alleviate the sufferings of the orphans of the anthracite fields, particularly in District No. 9, or to apply it in part on the expense of building the Locust Mountain Hospital, now being constructed for the treatment and care of men injured in the mines, they cannot make any such provision, for those thus benefited would only in part be the parties in interest.

The trustees pointed out that only those who contributed to the fund were such rightful participants and that any individual member of the company who had paid dues until the fund was discontinued could file objections and bring the trustees and company into court and demand their share of the fund if the trustees and the company gave the money for the purpose requested by the union.

In the course of the discussion between the union officials and the trustees it developed that there was one point of unanimity. They did not at first agree on the purpose to which the fund should be directed, but they all believed the fund should be reëstablished in some shape or other. The company and trustees propose that a form be inserted in the pay envelopes of each employee of the company for the first pay period in February, a signature on which will serve as a request of the signer that the operation of the fund be reëstablished. Mr. Matthews gives this plan his indorsement, and on Jan. 21 he and his coadjutors issued a statement to all the men urging them to sign in favor of the proposition as it will give them and their dependents added protection. The fund will not relieve the company in any way from the past, present or future obligations resting on it under the state Workmen's Compensation Law.

The fund will pay $300 in case of death at the mines by accident, and smaller amounts will be paid those who are incapacitated while working in or about the mines. A sum of from 25c. to 50c. will be deducted from the monthly pay of each employee. The trustees are W. J. Richards, president of the Philadelphia & Reading Coal and Iron Co.; W. D. Pollard, president, Safe Deposit Bank, Pottsville; and former Judge O. P. Bechtel, of Pottsville.

West Virginia Miners Oppose Price War

A plea for coöperation between miners and operators was made a few days ago by F. C. Keeney, president of District 17, United Mine Workers. In it he stated emphatically that his organization would not countenance "cutthroat" competition and the resulting reduction in wages to miners. His statement follows:

"There are certain operators, in the Clarksburg, Fairmont and Morgantown coal regions, asking their employees to accept a reduction in wages, saying that, if the mine workers would accept this reduction, it would enable the operators to get in the market, and furnish the miners steady work. Operators of the type just mentioned are to the fair operators who want to maintain the present prices what a nonunion miner is to the union miner.

"The mine workers recognize, in years that have gone by, that the operators of West Virginia were able to stay in business only by a very small margin, and in many instances bankruptcy was the result of the 'cutthroat' competition. The operators were forced to compel the miners to accept a wage that afforded a mere existence. But since the world war broke out and the United States Government became the determining factor in that great struggle for human rights, the coal industry for the first time in its history has been enabled to get proper recognition.

"The United States Fuel Administration fixed a selling price for coal that allowed the operators a fair profit, while it enabled them to pay the miners a living wage. After this experience it is almost inconceivable that certain operators should want to resort to the chaotic condition of the past. But seeing that certain operators are taking this position, we want the miners' position understood. The United Mine Workers of America will resent with all the force at its command any attempt of the operators to reduce wages.

"The miners want the coöperation of the coal operators and must have it in order to stabilize the coal industry. It is the basic industry of the nation and should have first consideration from the American public. We know that a great many of the coal operators are doing everything in their power to maintain such a selling price for coal as will enable them to give a living wage to their employees.

"We feel that the coal operators who are attempting to unstabilize the coal industry should not be given any consideration at the hands of the United Mine Workers of America, and they will not receive any consideration so far as I am concerned. It is an age of getting together and coöperation, and one in which we all recognize each other's rights; so we may just as well accept now the conditions as they are, as try to amend them and finally accept them later."

EDITORIALS

An Overdose of Reconstruction.

THE United States has a case of nerves. It has been worrying over much about its condition. A great congress of business doctors was called by the United States Chamber of Commerce, and it proceeded to tell Uncle Sam that he had eaten too much, devoured too many indigestible things, and was faced by too much of similar fare that would surely kill him if he attempt to consume it. The doctors assured him that all kinds of reconstruction dope would be necessary if he hoped to survive.

Uncle Sam didn't at first believe that he was so desperately sick. He had symptons, it is true, but then we all have symptoms, even when in the best of health. Straightway, as soon as he was told he was in a hard pass, Uncle Sam set himself down and tried to feel all the diseases the experts told him he ought to feel. He hadn't a spot without a pain, unless, indeed, it was a spot he hadn't pondered over. With such a sensitive bundle of nerves, with such a heated imagination, he could feel pain anywhere by taking due thought. The M.D.'s told him that he ought to feel sick all over, and he did. He has fairly worried himself into the "flu."

Let him bid goodby to his many doctors. The medicine they give may help a little, but it has to be continued and the dose increased if it is going to do any good. Subsidies, unusual Government developments and what not tone the part but wreck the stomach. The medicine soon ruins the whole man. What he need is cheerfulness and faith, and then we can leave in the shadow the old Uncle Sam who contemplates only whoas and woes, and go forward with the new Uncle Sam, buoyant and triumphant.

In this era of world reconstruction the great cry is for increased efficiency. This, of course, means the more general adoption of scientific management. The question is, How can we get this better efficiency and consequent higher individual production if the labor unions persist in their opposition to studies in time and motion in industrial plants? The stop-watch is necessary in the compilation of records to promote individual efficiency. If shorter hours and higher wages are to continue, and labor is going to earn more than formerly, it must be educated to know the necessity of increasing unit production.

Will Prices Go Up or Down?

THERE are a lot of injustices in the world as the result of the world war. Some exceedingly valuable artisans have seen their wages remain stationary when the wages of those in other industries were going up without stint. They read of the plethora enjoyed by other people and went home to every form of stinted fare and meager comfort. The bricklayer and the stonemason heard about the large wages of the riveters and calkers, yet had to be content or leave the industry. They and a number of others will be looking, now that the war is over, for a readjustment in accordance with living costs.

Such adjustments can only be upward, for so long as wages in general are high, cost of living must continue high. The labor unions will not permit the present wage scale anywhere to be lowered. This change in the rates of pay of the artisans who have not hitherto secured increases will make for higher prices. In fact now seems the best time for building. Construction is likely to be more, rather than less, expensive later. The present is the time for much construction work. It can never be done at lower prices

It is a common saying that wages are too high for business expansion. Many wage scales are indeed extremely high as we look backward, but it does not appear that even the highest are anything but normal as we look forward. And the future price of services, as of real estate and goods, is what really concerns us. Why lament that we cannot buy labor at 1913 prices when we have to manufacture or produce to sell during 1919?

The inflation of currency is widespread. If America alone had it we might expect it to fall like a wave in the ocean. But it is found everywhere, and is plainest in those countries where wages used to be lowest. Russia and Germany, which used to have low wages, now compensate labor more largely than ever, though of course the values of the coins in which wages are paid are far more inflated than our own. They are moreover uncertain. They all may be, and some will surely be, lowered when the period of revolution terminates.

But, nevertheless, no one can say that inflation is a purely local condition, peculiar to America. It is an international condition and in large degree it will endure. A little later the cost of living may descend, but the cost of construction is likely to rise. Even the cost

of living will depend on the harvest of the coming year, and conditions this winter may well not be favorable, for mild winters without much snow expose the winter wheat to all the rigors of the season.

All shelves are bare and many raw materials are short. It is said that in the Middle West the department and dry-goods stores were almost swept clean by the Christmas trade. The white-goods trade that followed swept the shelves completely, and buyers made trips to the East to try and replenish their stores, shipping the goods home by express. Everyone is now in need of goods. Most of us have been saving and have the money with which to buy. Banks are well supplied with the wherewithal for loans. What is lacking is confidence, not in credits so much as in the stability of prices. That confidence must soon be re-established, for prices of many things are lower than they are likely to be later. When the fact becomes duly impressed in the mind of the public there is going to be some spirited buying and a further inflation of values, especially in surficial forms of real estate.

The coal-mine manager today can do no more profitable and patriotic work among his employees than to campaign vigorously for a continuation of the thrift habit that secured such a good start in this country during the days of the war. Hoards of agents hawking all sorts of doubtful investments are busy tempting workmen to convert their Liberty Bonds and invest the proceeds in worthless securities. Every obstacle should be placed in the way of these cheaters and every incentive should be put forth to encourage the hard-working wage earners to avoid a return to the ways of extravagance and improvident spending. Nothing will do more to keep the wheels turning and promote a resumption of industrial activity than a continuation of nation-wide thrift. Accumulated wealth reproduces itself, and in doing so labor must be employed.

Because This Is a Government of the People

BECAUSE this is a Government of the people and by the people, it has the psychology of the people. It rises only with great difficulty above and beyond them. When times are good the nation buys, and it jostles to get what it needs. When times are bad it waits. When the public crowds to enter a door, or to circle round a mountebank, everyone else is drawn to do the selfsame thing. Similarly Uncle Sam, who is the American people in composite, will be found trying to go where everyone has gone. Because, by reason of our representative system, he is a cross-section of the public, he is almost sure to have the national psychology as his own.

Thus it is that we find the Government is skimping just now in its buying of railroad material, especially coal, and in its improvement of railroad lines. It is restricting its public building program. It will be found also that cities in the East are hesitating to build sewers, public buildings, disposal works or roads. The national mind, like the corporation mind, is the mind of the people. When the individual halts and fears, we all halt and fear. We all oppose expenditures. Uncle Sam sees John Smith has a wobbling step, and he sets his gait to suit.

However, given a public with hope in its breast, with a strut and with spirit, and Uncle Sam is a new man. He remarks that the day is bracing and spends a billion without much ado; and everyone of his grown children—the states in the Union—and all his smaller children—the municipalities or towns—do the same. So eager is he to get his work done that he rudely jostles the individual or corporation, seeking the same goal.

Too bad Uncle Sam has our psychology. If he had one of his own how he would trim the rocking boat of state! How he could create briskness and cheerfulness out of fear and despondency, and prevent surfeiting and congestion in times of overconfidence! He would serve us better, would our Uncle Sam, if only he were less like us.

Will War Bring a Foreign Psychology?

THE nations of Europe always had a psychology different from ours. No one, perhaps, knows why. Perhaps our energy is the cause. We must be ever up and doing, must make or break, must see things to an early conclusion. Whatever the reason has been, we were the people—the people of all the whole world—who discovered that sometimes it paid to conduct a business at a loss. And often indeed we so conducted it.

The arguments we had were good; that there is no use denying. We liked them the better because they were a trifle hard for the outsider to understand. But logical and solid in a way they certainly were. No! they will not be repeated here. Better that they should be entirely forgotten, for while they are true for the individual if he alone goes where they lead, they are not true, emphatically not true, for the industry as a whole or for the nation as a unit.

If an individual could induce all other individuals to sell at a profit, and he were to sell at a small loss, then it might be advantageous to him to do it rather than close down his operation. But if the other individuals show a disposition to cut their prices below producing cost, then it is up to the individual, who in a time of depression wants to keep running, with any degree of steadiness, to accept a little further loss. This is the "eternal spiral," if we may quote the expression of the British economists and twist its meaning to suit the present subject. They apply it to wage rises and costs of living. Here it is applied to the acceptance of a loss as a cause of progressively lower prices.

It is untrue, then, that it pays the individual to accept a loss, for he cannot prevent other individuals from doing the same and making other losses necessary. It is better to look at matters with more philosophy. It is better to say that selling for less than cost is a crime against the industry. Worse yet, it is a crime against the state; for if every individual in every industry did it, there would be a using up of capital; and the progress of mankind would be stopped, and civilization itself would be thrust even backward. Profitless operation is a using up of past accumulations. It is a destroying of fluid capital and an acquiescence in the decay of fixed capital.

So we need a psychology that will protect us against cutthroat competition, against our own self-destroying energies. Everyone but the American business man has it, and why not we?

DISCUSSION BY READERS

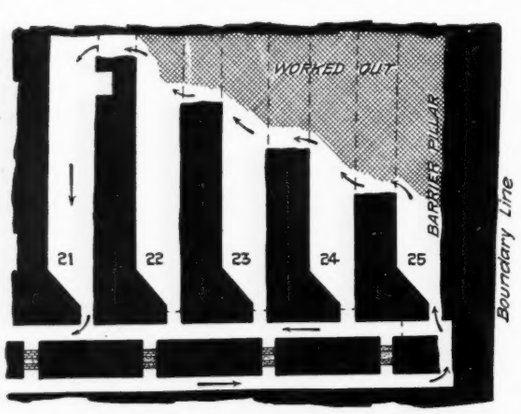
Drawing Pillars in Machine Mining

Letter No. 3—In looking over the inquiries in *Coal Age*, not long since, I ran across one from a brother foreman who asked for the experience of others who have used the Sullivan shortwall machine, in drawing pillars. Unfortunately, he has neglected to give the thickness of the pillar and some other data that would be of interest; but I am glad to give him my own experience along this line.

During the time that I was foreman of No. 1 mine of the Jefferson & Clearfield Coal and Iron Co., I was ordered to draw all the ribs in a part of the mine known as the "Ninth left." The coal in this section was 5 ft. high, overlaid with a slate roof, and pitched about 6 per cent. across the rooms, which were about 300 ft. long and varied from 20 to 35 ft. in width. These rooms were turned on 50-ft. centers.

Before going further, I want it understood that this work was driven before I took charge of the mine. The shape that it was in was a disgrace to any mine foreman. The mine was a machine mine entirely, no pick miners being employed, and I was obliged to undertake the task of drawing back the pillars with the machines.

After a short study of the situation and the conditions, I decided to adopt the plan shown in the accompanying figure. Starting at the last place on the heading, I determined to take out five pillars at a time, keeping the ends of the pillars a short distance, one in advance of the other next following, as I have shown in the sketch. This gave me a good line of break, more or less corresponding to the strike of the seam.



DRAWING PILLARS ON RETREATING PLAN

My method of attack, as shown on the left of the figure, where the pillar has been cut through at the face and a second cut started, was to cut through the rib, making a 15-ft. opening each time and leaving about 6 ft. of a stub between each cut and the last one. This 6-ft. stub, at the inby end, protected the cutter while at work. Sometimes this could be taken out by the machine, after the 15-ft. cut had been completed. At other times, it would be necessary to take the stump out with picks, which was done before the next cut was started.

One thing is important, and that is to see that all the posts are removed and none left standing in the gob. This is necessary, in order to keep a clean line of break extending across the ends of the pillars. I removed better than 90 per cent. of the coal from these pillars and rescued two-thirds of the timber. Considering the great variation in the thickness of the ribs, in this case, it was better than I had expected. I hope that my experience may be of benefit and help, not only to this brother foreman, but to others who have similar work on hand.

SAMUEL JONES.

Johnstown, Penn.

Letter No. 4—In reply to the inquiry regarding the drawing of pillars in machine mining, *Coal Age*, Jan. 2, p. 32, it would be easier to suggest the best method to apply in that case had the inquirer given the size of the pillars left between the rooms. He gives the width of the rooms as 27 ft. and the depth of cover 200 ft.; but says nothing of the width of pillars that are to be drawn, which is an important matter.

However, I want to give, frankly, a little of my own experience in drawing pillars by machines, in a mine of which I had charge as foreman. In one section of the mine, I determined to try drawing the pillars on the retreating system, keeping one pillar about three cuts in advance of the one ahead of it or outby, thus making the pillar work somewhat after the fashion of a longwall face.

FAILURE REQUIRES ADOPTION OF A NEW PLAN

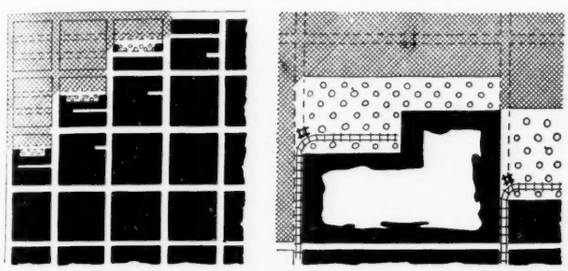
The coal was overlaid with a strong sandstone roof. For a while, the plan succeeded well and gave good results, although I watched with some anxiety for the breaking of the hard sandstone roof, which had not yet taken place. Much to my dismay, when the roof broke, it broke right up to the face of each pillar, in each case cutting off the straight face of the pillar.

Evidently, another plan had to be adopted if we were to succeed in drawing these pillars, by machines, under this roof. In order to start the work again, I had to cut across each pillar and open up a new face. But, from that time on, there was trouble, as the posts that were stood behind the face were not strong enough to break off the hard rock forming the roof. After some study, I decided to adopt an entirely different plan that I was convinced would give better results and save pillar coal, much of which had been lost in the previous method.

As shown in the accompanying figure, the plan now adopted was a longwall panel system, retreating. Eventually, I tried two systems, both of which are shown in the figure. By the first system, as shown on the right, the face of the panel was taken out in lifts. This

method was fairly successful, but did not give as good results as the second method, which is shown on the left of the figure. The drawing of the posts in one lift was left, until the next lift was finished. By this means there were always three rows of posts behind the lift that was being worked. As shown in the figure, one or two cribs were built at the side of the lift where the track entered, so as to give greater protection at that point.

As just stated, the second method, shown on the left of the figure, was the better of the two. In this method,



SHOWING TWO SUCCESSFUL METHODS OF WORKING

each pillar was split into two or three parts, according to the size of the panel. The hatched portion of the figure shows the portion of the mine where the coal had been worked out, the dotted lines indicating how each panel was split. As shown in the figure, a stump was left at each end of the cut, in order to give better protection for the machine while it was at work. These stumps were afterward taken out with the pick.

The aim in splitting a pillar was to divide it so as to provide two cuts for the machine in each part. These cuts were made on the gob side; but when the two cuts were finished, if the place was in good shape, I would frequently continue and take a cut on the other side, which made a total of three cuts for one split of the pillar.

I consider that this second plan is the safest and most practical method for taking out pillars with machines when the coal is overlaid with a hard rock roof that is difficult to break. WM. DICKINSON, SR.

Oak Hill, W. Va.

Effect of Prohibition in Mining

Letter No. 1—Now that the required number of states have ratified the constitutional amendment passed by Congress a short time ago, and national prohibition will soon be a fact in this country, I recall again the remark made by J. H. Tipton, *Coal Age*, Dec. 12, p. 1087, to the effect that "too much emphasis" has been placed on the matter of intemperance among the miners.

This suggestion was made by Mr. Tipton in discussing the hindrances to coal production. While I agree with most of what he has said and do not want, for a moment, to disparage the numerous good points made regarding the effect of other hindrances to coal production, I must take issue with him on that one point.

Too much emphasis, in my opinion, cannot be laid on the evil effect of intemperance among miners. It has been the cause of the loss of thousands of tons of coal when that was most badly needed. It has been responsible for the personal injury of many mine workers, because a drinker has been permitted to enter the mine when unfit for work and in a condition in which he could not be held responsible for his acts, which endangered not only his own life but the lives, also, of his coworkers.

In his letter, Mr. Tipton offers some important suggestions for overcoming hindrances to the production of coal. He makes special mention of improving the living conditions of miners, and speaks of the need of greater efficiency on the part of foremen in charge of mines. I am convinced that if proper living conditions are provided and some form of amusement and recreation furnished the men, in mining towns and camps, there would be less drinking, and the chief hindrance to the production of coal would be removed.

If one takes the trouble to compare the loss of production due to intemperance in a mining community where these things are provided, with the loss from the same cause in a community where no such privileges are offered and nothing done to keep the miner out of the saloon, it will be found that the loss will be considerably greater in the latter instance than in the former.

Let me repeat what I said in the beginning, that too much emphasis has not been laid on the effect of intemperance to reduce the production of coal. As long as the manufacture and sale of liquor is a legal business and the doors of the saloon are open to miners and other industrial workers, the effect can only be to hinder production in all industries. But, to none will national prohibition prove a greater boon than to coal mining.

Pittsburgh, Penn. EDWARD H. COXE.

Living Condition at Mines

Letter No. 1—As the readers of *Coal Age* all know, labor conditions have been very unsettled, during the past two years at least, and there is not much improvement apparent at the present time. The principal trouble is experienced in isolated mining districts where the dwellers have not the same privileges that are afforded residents of larger towns and cities.

The thought that has been uppermost in the minds of many coal operators, not only in such isolated districts as I have mentioned, but elsewhere, is how hard it is to get labor and to hold it. The labor question, indeed, has caused much thoughtful discussion. Various remedies have been suggested, some of which have been tried out with good results, while others have proved failures.

Having spent all my life in and around coal mines and, for the last 15 years, serving as a mine official, I have been led to make a careful study of the miner, both at work and at play. Let me say then, here and now, that with few exceptions, the natural disposition of the miner is one of pride. He asks no one to give him anything but justice, being proud of his ability to earn his living and pay for all his necessities.

The argument has been advanced that to close the saloon and abolish booze will solve the labor question in mining; but that is only partially true. While it will make sober men out of drinkers, it will not hold mine workers in isolated districts that are devoid of those common privileges that make living worth while, such as schools, churches, good roads and dwellings, with

places of amusement and recreation. Observation while living in such districts makes this conviction, in my mind, a fact.

From time to time, when good men were quitting our mines for work in other places, my inquiries as to the cause of their leaving would almost always bring the following responses: "There are no good roads in this town."—"The schools here are no good."—"There are no churches here that we can attend."—"My family are unable to get what they need at the store," etc. Seldom did it happen that a man would leave because of a simple error in his accounts, which was always quickly corrected at the office and the man satisfied.

When I would take a man to task for getting drunk and laying off he would promptly reply that there was "no place but the saloon" where he could go and spend an hour or so when out of the mine; "no shows, poolrooms, bowling alleys, or even a reading room," where he could spend his spare time. Many would claim that they did not want to stay at home all the time and must go somewhere.

Taking these facts into consideration, let me ask if coal operators have ever wondered why they could get and keep labor with less difficulty where a mine is located close to a town, than where it is located in an isolated district; even though the working conditions in the former were inferior to those in the latter instance. Can anyore deny that it is the duty of mine officials to deal strictly, fairly and honestly with men in their service? Does anyone doubt that that is the only way to get and hold their confidence?

Efforts of Mine Officials Necessary to Promote Satisfaction Among Employees

It may and generally will require much extra effort, on the part of mine officials, to secure for their men these privileges, which are accounted as essential to good living conditions. The question of "good roads" is one to be taken up and advocated strongly by the operator who pays the taxes. Likewise, the matter of providing "good schools" is one that will depend on the influence and the interest that the mine management and officials take in matters relating to the school board.

As to the "church," very often a small donation of either money or ground, on the part of the operator, will encourage the residents of the camp to build a church and pay their share toward the maintenance of its services. Where this is not practicable, at the present time, there are generally two or more houses standing empty that could, with a few necessary changes, be made available for service, both Protestant and Catholic. Other places could be provided as "reading rooms, poolrooms, and bowling alleys."

A wise management will endeavor to provide the occupants of the company houses with such conveniences as they may desire or need for their comfort. Some dwellers may even desire electric lights. Most will desire baths and toilet conveniences. Speaking of baths, however, it must be admitted that there are some, among the foreigners, who will not take proper care of a bathroom should it be provided for them. These should not have such conveniences, until they are educated sufficiently in their proper use and care.

Finally, in regard to the "company store," there should be provided a good uptodate department store, where the miner and his family can procure what they need and desire, at prices at least as low as the same goods can be bought elsewhere. Customers should be treated with the utmost courtesy and fairness.

The education of the miner has elevated him to a standard of living where the conveniences and privileges I have mentioned have become necessities to him and his family. What the miner needs, aside from good working conditions, are home surroundings that he is qualified to appreciate and amply able to purchase, for the comfort of himself and family. All that I have mentioned can, under proper management, be made self-supporting and not a source of expense, but a source, rather, from which will come an increased production of coal.

A. A. Allen, Asst. Genl. Supt.,
Pittsburgh, Penn. United Coal Corporation.

Perils in Reconstruction

Letter No. 2—Now that the war is over and the mines will soon be running full-handed again, we begin to wonder what hindrances will arise in the future to restrict the production at the mines. No one is expecting to witness soon again the conditions that hampered the mining of coal and caused so much suffering a year ago. During all that trying period, miners proved their patriotism and showed that they were worthy of the trust reposed in them.

Now, however, the situation that confronts us is of a different nature than what existed during the time this country was at war. We are now facing a crisis that will demand the best judgment of operators and miners alike. The most difficult of the problems liable to arise is the adjustment of labor questions. Unfortunately, as we are all well aware, there is a dangerous propaganda that is being circulated daily among our miners. If this is not soon checked, it is bound to create conditions that the miners themselves do not desire. Strange as it may seem, the miners are unwittingly permitting themselves to fall victims to what we can describe by no better term than "Bolshevism."

Earnest Appeal to Labor to Make Good

No one doubts, today, that we are entering upon the most important period respecting the future of this and other countries. Regard for one another's welfare must now take the place of selfish ambition and it is for the people of America to prove to the world that the love of one's fellowmen is a more powerful factor in securing equity and justice than is violence and bloodshed, which must follow in the wake of Bolshevism. It is to be hoped that the laboring element of this country will prove all that is claimed for it by the President, who has stated that he considers it the most important asset of the nation.

One condition that it behooves all mine superintendents and foremen to consider carefully and prepare plans to meet is the homecoming of our boys, who responded so nobly to the call of their country in its hour of need. No doubt, the quick return of the boys will change industrial conditions throughout the country; but the effect in coal mining should prove a benefit by displacing some who are unacquainted with mining conditions and whose employment was forced by the urgent need of men to get out the coal.

When we consider that there was enough work for these men before they entered the war, and realize the large number of them who have been slain or crippled for life, and others who will not return because of affiliations formed abroad, it should be clear that there will be work and *steady work* for all.

In closing, let me urge that we give this matter serious consideration and prepare ourselves for the change that is coming and is even now here. Any intelligent foreman will welcome the advice and knowledge to be gained through a practical discussion of ways and means to meet the situation with fortitude.

Plymouth, Penn. JOSEPH R. THOMAS.

Letter No. 3—I have been impressed with the numerous predictions that have been made from time to time, in regard to what was going to happen after the war. While some have claimed that the end of the war will mark a period of unprecedented prosperity, others predict that it will bring a time of trade depression and uncertainty. Still others believe that we shall pass from war to peace as easily as sliding off a log.

Now, while I despise the attitude of a pessimist, the thought that impresses me most is that, looking at things as they are, big changes are in sight. But, before there will be any great change for the better, we shall experience a change for the worse. Everyone, therefore, should put his house in order and prepare himself to meet this change when it comes.

EFFECT OF RECONSTRUCTION WORK IN EUROPE ON LABOR IN THIS COUNTRY

The work of reconstruction in Europe, many believe, will call a large number of our foreign labor home. If this should take place it would undoubtedly imperil many of our industries, particularly the mining of coal. At the same time, it must be remembered that there will be thousands of those in foreign lands who will seek a home on American soil when the first opportunity offers, and this influx may more than offset the loss to us of those who return to their own country.

Also, the anticipated scarcity of labor in this country will be largely counterbalanced by the return to their homes of our 3,000,000 soldiers in training and in service. In addition to this, the shutting down of munitions factories and the slowing down of our shipbuilding will greatly augment the available labor force here. It is well known that thousands of our miners left the mines to work in these factories. Moreover, the slacking down of mills, closing of factories and the cessation of other war activities will greatly reduce the demand for coal. In fact, according to the market reports, there is an increasing amount of coal already on hand; and this, in face of the fact that production at the mines has been greatly impaired by the influenza epidemic, shows that the demand for coal is already falling off.

What will be the effect of our Government withdrawing its protective hand that has, for some time past, controlled both the price and the shipment of coal, it is hard to say. Competition will increase, in the coal industry, with the result that the price of coal will be lowered and this, in turn, will reduce wages, which means a struggle, unless the price of living necessities is likewise reduced. Should these things occur, we would face a new peril in the form of labor disturbances.

No doubt, it will be argued that the building of a great merchant fleet will soon enable the carrying of our coal all over the world and that this will act to stimulate the coal trade. It is asserted that we can produce coal as cheaply as England; but, our country being a self-supporting nation, making larger exports than imports, presents the difficulty that our ships carrying coal to foreign ports must return in water ballast, while English ships will take home a cargo of much needed supplies. It does not take a scholar to estimate the difference in the price of our coal and that of England, in foreign ports, under these conditions.

Let us look boldly at these perils and do what we can to overcome them before they are upon us. We are proud to have brought peace to the war-ravished countries of Europe; let us not fail, now, in securing a lasting industrial peace to ourselves and the world.

McIntyre, Penn. THOMAS HOGARTH.

Quality of Mine Timber

Letter No. 1—Reading the recent letters, regarding the drawing of pillars in machine mining, which have appeared in *Coal Age*, calls to my mind an incident that occurred, a short time since, when the division superintendent, the mine superintendent and myself, were making an inspection of the mine of which I had charge.

On that occasion, we had stopped, in a certain miner's place, for a few moments' rest. While seated there, the conversation turned on the drawing back of pillars, which work had just been started in that section, and the division superintendent remarked that I should be sure to see that the rooms were well posted before ever starting to rob the pillars.

The miner, who was working the place, had been attentive to all that was said and, at this juncture, butted in with the remark, "Yes, but we need better posts than those that were brought in to me today. You would hardly believe that I broke one of them in two, trying to drive it up in place. They are entirely too small and not strong enough to support this roof. They make me think that they were made more for match sticks than for mine posts."

THE TRUTH SPOKEN FRANKLY AND BOLDLY

The miner, whose life was daily in jeopardy by reason of the poor quality of timber sent to him, was more outspoken than most men working in the mine would have been. That he had spoken the truth, however, was plainly evident and it made its impression where the lesson was most needed. It is unnecessary to add that a better quality of posts was sent into the mine from that time forward, particularly where they were needed in pillar work.

I mention this little incident in the hope of drawing attention to the quality of timber often furnished to miners, both in respect to the size of the sticks and the kind of timber employed. Ash, oak and other hardwood timbers are better adapted for use on roads and aircourses where they must remain for some time, while pine, hemlock, spruce and many like soft timbers give better service in rooms where the yielding of the posts is an important factor in observing the movement of the

roof and the pressure on the timbers. However, the size of all post timber, hard or soft, must be such as to give the required strength. FOREMAN.

———, Penn.

Freezing of Shaft in Winter

Letter No. 10—After reading the several letters that have appeared in *Coal Age*, in regard to preventing the freezing of a shaft in winter, it seems to me that half of the writers have forgotten that there are many mines that are equipped electrically and have no steam to use for this purpose. The other half seem to ignore the fact that the one main point that is necessary to be considered is the rise of temperature required to prevent the freezing of the water draining into the shaft.

Now, it does not appear to me that it would pay, where a mine is electrically equipped, to install a boiler for the purpose of generating steam when the weather is sufficiently cold to freeze the shaft, which would be at irregular intervals during the winter. Those who advocate the use of steam argue that this would increase the humidity of the mine air; but it strikes me that, if the air is preheated before passing down the damp shaft, it will absorb the required amount of moisture and accomplish the same purpose.

It is suggested in Letter No. 1, which appeared in *Coal Age*, Dec. 19, p. 1134, that all that is needed to heat the air is a hot-air chamber installed near the top of the shaft. If the suggested 12-in. pipe is not sufficient for the purpose desired, there can be any number of pipes, or a much larger pipe, installed to conduct the hot air down into the shaft.

For that matter, a rectangular pipe 3 x 8 ft. in section, giving an area of 24 sq.ft., could be used. Also, if necessary, two such hot-air chambers could be installed for heating the air. This method appeals to me as being more practical and simple than those suggested.

Holsopple, Penn. MINER.

[This letter will close the discussion on "Freezing of Shafts in Winter."—EDITOR.]

Perplexities of Mine Foremen

Letter No. 10—Among the several letters that have been written describing various perplexities that are the lot of mine foremen, none have impressed me so forcibly as the letter of John Rose, which appeared in *Coal Age*, Nov. 28, p. 1002. As Mr. Rose says, there is a class of miners that are continually on the hunt for the boss to make some complaint.

My experience is that there are few mine foremen who will not listen to a man when he has a serious complaint to make. A good foreman very quickly learns to know who the miners are that are never satisfied but are continually kicking about one thing or another. Were the foreman to attend to every such complaint, he would have little time left to see that the mine is kept safe and the coal moving.

When a mine foreman has done his duty and furnished the necessary material to make a man's place safe and the miner has not done his part to keep up his place, it is no fault of the foreman's that trouble overtakes the man. A foreman cannot waste his time going to look at such a place, especially when he knows that the miner will load no more coal if his place was timbered for him.

On the other hand, a good man can usually get all the help he needs from his foreman, who has come to know the value of the man's service in maintaining the output of the mine. After all, it is the man who produces the most coal who has no difficulty in securing the prompt attention of his foreman when he has a complaint to offer.

It is true that during the recent labor shortage, many mine foremen have spoiled their men by doing more for them than customary. This has resulted in some miners starting to do as they please; and, in a short time, they please to do very little. From fear of losing their men, many foremen have adopted these methods to hold them.

FALSE CLAIMS OF INCOMPETENT FOREMEN

Foremen who are constantly making concessions are prone to boast of their ability to handle men, when, in fact, the man has often proved to be the real boss. I am glad to say it is not so in every case. There are foremen who will not keep a man on the payroll if he does not work to their satisfaction. While such treatment may sometimes work a hardship on the men who wish to do right, by starting unmerited rumors of harsh dealing, good results will be accomplished in the end.

As an illustration of how unreasonable some men are, let me cite an instance that occurred a short time ago. The track on one of the main hallways, in a mine, had just been torn up by the derailment of a loaded car. There were 25 men working on that section and, not to delay their work, I started at once to find the trackmen. They were busy fixing the track in a place where two men were waiting to load a car.

Explaining the situation in a few words, I sent the trackmen to repair the track on the main haul, telling them to then return and fix the track for the two men in the room. I stated that it would not require more than 45 min. to complete both jobs. In spite of everything that I could say or do, however, the two men took their buckets and went home for the day, although their track was fixed and ready for them before they could have gotten out of the mine.

UNREASONING ACTS OF MEN ANNOY GOOD FOREMEN

It is such acts of unreasonableness on the part of men that perplex and worry mine foremen. The average foreman is full of "pep" and anxious to keep things moving while, at the same time, endeavoring to satisfy his men. He realizes that his chances are small of ever making good unless he can keep a satisfied bunch of men.

While not neglecting too long the little things that require his attention each day, a foreman must give himself chiefly to the larger and more important matters that affect the safe and efficient operation of the mine. The discussion of these conditions that are so well known to mining men has done much, within the past two years, to enlighten the general public and secure a fairer judgment on their part, regarding the men in charge of coal-mining operations.

Cleaton, Ky. OSTEL BULLOCK.

[The discussion of "Perplexities of Mine Foremen" will close with Letter No. 12 now on hand.—EDITOR.]

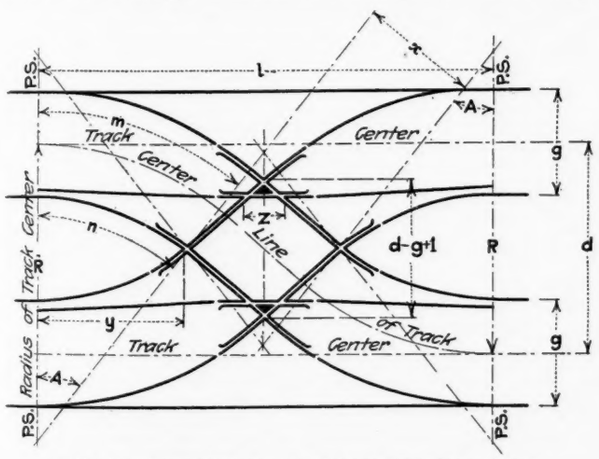
INQUIRIES OF GENERAL INTEREST

Diamond Crossover in a Mine

As mine foreman, I would like to be able to understand the method of calculating the different dimensions of a diamond crossover, such as is commonly used at a shaft bottom, for cross-caging, to enable the loaded cars to be run on either cage and permit of the removal of the empties. I shall much appreciate the favor if you can give me the formulas required to work out these several dimensions. FRANZ WALTHERS.

Buckskin, Ind.

When a diamond crossover is to be laid, the data commonly given or known are the gage of the track and the distance between track centers. Four frogs are required, two of which lie midway between the two tracks. The other two frogs are cast so that a small triangle of solid iron forms the center of each frog. The three sides of the triangle are parallel to the respective gage lines of the three rails crossing each other on this frog. To insure successful operation, these three gage lines must cross each other at three separate points, corresponding to the three apices of the triangle. The accompanying figure shows the general arrangement of the two main tracks, the crossover rails and the four frogs.



THE DIMENSIONS OF A DIAMOND CROSSOVER

It is important to remember that the arrangement of the tracks in a diamond crossover is symmetrical with respect to its central axes. The gage lines of the switch rails crossing the frog in the main track, each make an angle with the gage line of the main rail equal to the angle subtended by the curved switch rails, or the angle A, indicated in the figure.

The first step is to find the angle A that subtends each of the curved rails of the switch. To simplify the calculation, we will assume that the two gage lines of the switch rails cross each other 6 in. inside of the gage line of the main rail. Then, calling the distance between track centers d and the track gage g, the distance measured straight across the main tracks, between the two points where the gage lines of the two switch rails across each other, is $d - g + 1$, as indicated in the figure. The required angle subtending each curved switch rail is then found by substituting the given values in the formula

$$Cos\ A = \frac{g}{d - g + 1} \qquad (1)$$

The next step is to find the length l, out to out, of the diamond. This is the distance from point of switch (P. S.) to point of switch, measured on the straight track, as indicated in the figure. A convenient length of radius R, which is the radius of the center line of each switch, is first assumed. The chosen length of this radius must be such as to conform to the given track dimensions and the approximate desired length (l) of the diamond.

For instance, the shorter the radius chosen, the sharper will be the curvature of the switch rails and the shorter the diamond. On the other hand, where the room permits a longer radius can be chosen, giving easier curves but lengthening the diamond. Having chosen the radius R, the length l of the diamond is found by the formula,

$$l = 2R\,sin\,A + \frac{d - 2R(1 - cos\,A)}{tan\,A} \qquad (2)$$

The length (x) of the straight piece of rail, joining the opposite switch rails of the crossover, is next found by substituting the given values in the formula

$$x = \frac{l - 2R\,sin\,A}{cos\,A} \qquad (3)$$

It is evident that the radius of the outer curved switch rail is $R + \frac{1}{2}g$; and that of the inner curved switch rail, $R - \frac{1}{2}g$. Then, the length (m) of the outer curved rail, in each switch, is found by the formula

$$m = \frac{A}{180^\circ} \times 3.1416(R + \tfrac{1}{2}g) \qquad (4)$$

Likewise, the length (n) of the inner curved rail is given by the formula

$$n = \frac{A}{180^\circ} \times 3.1416(R - \tfrac{1}{2}g) \qquad (5)$$

In formulas 4 and 5, the value of the angle A must be expressed in degrees and decimal of a degree.

Finally, the distance y, indicated in the figure, or the distance that each center frog is in advance of each main switch point, is found by the formula

$$y = \sqrt{(R - \tfrac{1}{2}g)(d - g) - \tfrac{1}{4}(d - g)^2} \qquad (6)$$

When laying out the triangular frog, assuming that the gage lines of the two switch rails across each other 6 in. inside of the gage line of the straight rail of the main track, the distance (z) between the two frog points (see figure), measured on the main rail, is $z = 1/\tan A$, which gives this distance expressed in feet; or $12/\tan A$, expressed in inches. The center line of the two triangular frogs corresponds to the center of the diamond crossing the tracks at right angles.

EXAMINATION QUESTIONS

British Columbia Examination Second Class, Dec. 17, 1918

(Selected Questions)

Ques.—What would be the danger arising from a blownout shot in a mine atmosphere charged with coal dust and a small percentage of firedamp?

Ans.—The occurrence of a blownout shot and the projection of a considerable volume of flame into a mine atmosphere charged with coal dust, especially when a small percentage of marsh gas is present, would result in the flame of the shot igniting the mixture and an explosion would follow. If methane or marsh gas is present in sufficient quantity to form firedamp the mixture would be fired by the flame of the shot even though no coal dust were present.

Whether the local explosion started by a blownout shot will be transmitted throughout the mine will depend upon the condition of the mine air and the passageways. If these contain accumulations of gas or dust, the explosion may be propagated throughout the mine. The contracted roads and airways in thin seams, by preventing the rapid expansion of the gases produced by an explosion, tend to increase the violence of the blast and extend the explosion. Thicker seams and larger areas provide for a greater expansion of the burning gases, which lowers the temperature and tends to arrest the explosion.

Ques.—In spontaneous combustion in a coal mine, what gases are produced? What are the probable causes of spontaneous combustion and what general precautions would you adopt to prevent it?

Ans.—The gases produced by any combustion in a coal mine will depend on the supply of air. Where this is sufficient for complete combustion to take place, carbon dioxide (CO_2) is formed; but if the supply of air is limited so that the combustion is more or less incomplete, some carbon monoxide (CO) will be produced, the quantity depending solely on the limitation of the air supply. In a close place, the oxygen of the air being partly consumed causes an excess of nitrogen as the result of the combustion.

The primary cause of spontaneous combustion is the generation of heat accompanied with the production of some carbon monoxide in a mass of carbonaceous material, owing to the slow oxidation of the carbon. The action is greatly accelerated where carbonaceous or oily and bituminous matters are stored in a place where there is no ventilation and the escape of the heat is prevented. To avoid the conditions producing spontaneous combustion, no accumulations of oily waste, fine coal dust or other carbonaceous material should be permitted in the mine. In the storing of large quantities of coal, suitable provision should be made for ventilating the pile, so as to carry off the heat and gas generated in the mass.

Ques.—How many cubic feet of marsh gas will be required to be generated in a mine, per minute, to render dangerous a current of 60,000 cu.ft. of air per minute?

Ans.—The answer to this question will depend on first determining what is the danger line in the particular mine in question. In the mining of anthracite coal, the danger line may be assumed to be reached when 3 per cent. of gas is present in the return airway; but steps should be taken to avoid possible danger before this condition is obtained. In the mining of bituminous coal, much will depend on the inflammability and character of the coal in respect to the formation of fine dust. Where the coal is highly inflammable and the mine dusty the danger point is reached when the gas in the return airway much exceeds one per cent.

Therefore, replying to the question in regard to the quantity of marsh gas required, in this case and on the assumed basis, in a bituminous mine, it may be stated that the danger point will be reached when the gas generated is $60{,}000 \times 0.01 = 600$ cu.ft. per minute.

Ques.—The total rubbing surface of a square airway is 150,000 sq.ft.; the length of the airway is 4500 ft. and the quantity of air passing 75,000 cu.ft. per min. What is the velocity of the air current, in feet per minute?

Ans.—The perimeter of this airway is $150{,}000 \div 4500 = 33\frac{1}{3}$ ft. The airway being square, the length of one side is $33\frac{1}{3} \div 4 = 8\frac{1}{3}$. The sectional area of the airway is $(8\frac{1}{3})^2 = 625/9$ sq.ft., and the velocity of the air current $75{,}000 \div 625/9 = 1080$ ft. per minute.

Ques.—The quantity of air passing in an airway is 140,000 cu.ft. per min., and the water gage is 2 in. What is the horsepower producing the ventilation?

Ans.—The pressure corresponding to a 2-in. water gage is $2 \times 5.2 = 10.4$ lb. per sq.ft. The horsepower producing this circulation is, therefore, $(140{,}000 \times 10.4) \div 33{,}000 = 44+$ horsepower.

Ques.—In an airway measuring 7 ft. 6 in. high, 8 ft. wide at the top and 9 ft. 6 in. at the bottom, the anemometer reads 350 r.p.m.; what is the quantity of air passing?

Ans.—The average width of this airway is $\frac{1}{2}(8 + 9\frac{1}{2}) = 8\frac{3}{4}$ ft. and the sectional area $7\frac{1}{2} \times 8\frac{3}{4} = 65\frac{5}{8}$ sq.ft. The quantity of air passing is, then, $65\frac{5}{8} \times 350 = 22{,}968+$ cu.ft. per minute.

Ques.—Describe the various means used for conducting and regulating the air current in mines.

Ans.—The most common means employed for conducting the air forward in mines is a brattice constructed of boards or canvas nailed to a row of posts set for that purpose. The air bridge, either an overcast or undercast, is used to conduct an air current across a roadway or another air-course and thereby avoid the use of doors on the entries. A regulator is a partition built in an airway and having a small hole to enable a portion of the air only to pass.

FOREIGN MARKETS AND EXPORT NEWS

War Board Justifies British Import Restriction

Great Britain's action in applying import restrictions, which cover a wide range of commodities, is fully justified in the opinion of the War Trade Board. In order that the reason which prompted the British to take that action may be better understood, the War Trade Board comments on it officially as follows:

For over four years Great Britain has been subject to the shock and strain of a war which not only required the sacrifice of life and intense human energy, but also necessitated the most stringent economic readjustment and the sacrifice of private business.

It is not strange, therefore, that Great Britain should today wish to make every legitimate effort to keep her commercial and economic status from falling into chaos, and instead to restore it to a state of equilibrium. In fact, to do anything else would be strange.

As a natural result of such a normal, patriotic aspiration, in order to bring her own manufactures to a state of stability approaching that of pre-war days, Great Britain finds it necessary to impose such import restrictions for the time being as will permit her the opportunity to reëstablish domestic business conditions on a normal basis. The import restrictions being imposed by Great Britain are for such purposes and are not to be regarded as of a permanent nature. In making for the return of normal domestic conditions in Great Britain, inducing the social welfare of the empire, such measures will tend toward economic and social stability throughout the associated governments and this country. And such a tendency is today recognized as vitally necessary for the formation of a lasting and fundamentally sound peace.

Simplified Bunker Procedure

The War Trade Board announces that it has adopted a new and much simplified form for use in connection with the issuance of bunker licenses. The new form is a Combined Application and License (No. B-1c), and supersedes Bunker Forms B-1a and B-1b.

When Bunker Form B-1 has been completely filled out and signed by the applicant and approved and countersigned by the agent of the Bureau of Transportation or Collector of Customs, as the case may be, it will constitute a bunker license for all bunker fuel and ship's stores aboard the vessel and those desired to be taken on at the port where the application is submitted, as well as at any subsequent port in the United States or its possessions at which the vessel calls on the voyage for which license is issued, it no longer being necessary to obtain supplementary license at subsequent American ports when additional fuel or stores are desired.

A complete list of bunker forms at present in use follows: Bunker Form B-1c, Bunker Form B-3, Bunker Form B-4, Bunker Form B-5a or B-5b, Bunker Form B-7. Bunker Forms B-1c, B-3 and B-7 are required on all vessels. Bunker Forms B-4, B-5a and B-5b are not required of certain classes of vessels.

For further information, those interested should confer with Agents of the Bureau of Transportation, War Trade Board, or Collectors of Customs at ports where there are no agents.

Coal Exports From the Port of New York During 1918

Complete reports show that during 1918 there were shipped to foreign countries through the Port of New York 82,447 tons of anthracite, valued at $584,087; 48,717 tons of bituminous, valued at $349,369; and 10,937 tons of coke, valued at $174,114. In 1917 the exports from this port amounted to 134,252 tons of anthracite, valued at $987,178; 14,348 tons of bituminous, valued at $91,534; and 21,908 tons of coke, valued at $283,735.

Of the coal exported Canada received 68,763 tons of anthracite, valued at $482,834, an average cost of $7.02 per ton; 5487 tons were shipped to Newfoundland; 4669 tons to Cuba, and 220 tons to England.

France received 7140 tons of coke; Brazil, 1269 tons; Argentine, 2670 tons; and Italy, 220 tons.

The bituminous shipments were sent to many countries. Of the 48,717 tons exported Cuba received 1776 tons; San Domingo, 3988 tons; Canada 192 tons; Brazil, 27,065 tons; Argentine, 3750 tons, Dutch West Indian Islands, 2408 tons; Uruguay, 1750 tons; and the Falkland Islands, 3565 tons.

In 1917 Brazil received 1999 tons of bituminous through this port, and San Domingo, 755 tons. During the same period 98,402 tons of anthracite were shipped to Canada and 9445 tons to Newfoundland.

The shipments by months in 1918, as compared with 1917, are given in the accompanying table.

	Anthracite		Bituminous		Coke	
	1917	1918	1917	1918	1917	1918
January	7,934	490	2,049	530	1,660	1,599
February	4,981	1,184	1,731	2,157	1,211	44
March	13,720	2,607	3,224	4,508	505	956
April	8'339	7,107	171	3,081	1,325	633
May	16,714	4,444	995	8,117	1,900	2,153
June	14,693	6,761	1,939	6,807	3,650	1,605
July	15,967	9,340	448	7,440	3,434	117
August	3,942	10,460	967	10,149	1,763	333
September	26,988	13,602	593	3,449	2,901	106
October	3,288	11,656	43	1,045	1,539	203
November	10,856	9,182	1,229	221	304	494
December	6,831	4,614	959	1,213	1,716	2,694
Totals	134,252	82,447	14,348	48,717	21,908	10,937
Valuation	$987,178	$584,087	$91,534	$349,369	$283,735	$174,114
Average cost per ton	$7.34+	$7.08+	$6.37+	$7.17+	$12.95+	$15.92+

Foreign Freight Rates

W. W. Battie & Co.'s coal trade freight report for Feb. 3 states:

In the West Indian business few charters are effected owing to the scarcity of orders. Steamers may be had of most any size and position for this business. Owing to the scarcity of tonnage, the South American market is very dull. The chartering committee's rates are as follows:

Steam—Havana, $7.50, 600 tons dis.; Cardenas or Sagua, $9, 300 tons dis.; Cienfuegos, $9, 500 tons dis.; Caibarien, $9.50, 300 tons dis.; Guantanamo, $8.50, 500 tons dis.; $9, 400 tons dis.; Manzanillo, $9.50, 300 tons dis.; Bermuda, $9.50, and Bermuda, p. c. and dis. free, 300 tons dis.; Kingston, $9.50, 400 tons dis.; St. Thomas, $10, 500 tons dis.; St. Lucia, $11, 500 tons dis.; Santiago, $8.50, 500 tons dis.; $9, 400 tons dis.; Barbados, $11, 500 tons dis.; Port of Spain, Trinidad, $11, 500 tons dis.; Curacao, $10.50, free p. c. Curacao, 500 tons discharge.

Sail (maximum)—Para, $15.50 net; Bahia, $18.50 net; Pernambuco, $18.50 net; Rio, $19.50 net; Santos, $19.50 net; Buenos Aires, $18.50 net; La Plata, $18.50 net; Montevideo, $19.50 net. (Gross rates $1.50 per ton in excess of net rates). On all the foregoing rates, charterers pay vessel's towage to coal port. To Nitrate Range, $16.50 gross prepaid. (Same rate steam.)

The Chartering Committee's rate by steam is $19.50 net to Rio or Santos, $18.50 net to Buenos Aires and $19.50 net to Montevideo.

Ships Being Released

Vessels are being steadily released from Government service by the United States Shipping Board and placed back in trade service again. Coupled with the recent cuts in ocean freight rates, this is expected in some quarters to revive the export business. Some confustion is still being reported in connection with chartering and freights. Criticism has been heard of the cut in rates to some French ports when there is no American tonnage available to those ports.

Hampton Roads Coal Exports

			Cargo	Bunkers
NORFOLK				
Lamberts Point				
Jan. 27	Ital. Bk. Estrella	Puerto Ferrajo, Italy	1,826	....
Jan. 27	Am. S.S. Yaque	San Domingo City, S. D.	1,372	353
Jan. 27	Ital. Bk. Letizia	Bagnoli, Italy	1,916	....
Jan. 27	Am. S.S. Lake Shawano	San Juan, P. R.	2,477	396
Jan. 28	Am. S.S. Soestdijk	Buenos Aires, A. R.	6,013	1,615
Jan. 29	Ital. Bk. Herat	Puerto Ferrajo, Italy	1,853	....
Jan. 29	Nor. S.S. Roar	Manzanillo, Cuba	1,685	221
Jan. 29	Fr. Bk. Dunkerque	Iquique, Chile	3,785	56
Jan. 29	Am. Sc. Grand Turk	San Juan, P. R.	799	....
Jan. 30	Ital. Bk. Stefano Oberti	Piombino, Italy	2,165	....
Jan. 31	Am. S.S. Winterswijk	Rosario, A. R.	4,028	848
Jan. 31	Am. S.S. Craycroft	Havana, Cuba	2,736	395
Jan. 31	Swed. S.S. Mertainen	Montevideo, Uruguay	4,506	1,919
Sewalls Point				
Jan. 28	Br. S.S. Justin	Para, Brazil	458	1,382
Jan. 28	Br. S.S. Justin	Manaos, Brazil	519	....
Jan. 29	Nor. Sp. Karmo	Buenos Aires, A. R.	1,607	....
Jan. 29	Am. S.S. Lake Deval	Havana, Cuba	2,624	289
Jan. 31	Am. S.S. Lake Fluvanna	Havana, Cuba	3,003	214
NEWPORT NEWS				
Jan. 27	Br. S.S. Trevince	St. Vincent, C. V. I.	5,142	462
Jan. 29	Am. S.S. Corrales	Antilla, Cuba	2,550	385
Jan. 29	Am. S.S. Garfield	Havana, Cuba	3,053	409
Jan. 29	Am. S.S. Sac City	Montevidel, Uruguay	5,924	....
Jan. 29	Am. S.S. Lake Aurice	Antilla, Cuba	2,802	444
Jan. 30	Nor. Bk. Plus	Rio de Janeiro, Brazil	1,690	....
Jan. 30	Nor. S.S. Clothilde Cuneo	Cienfuegos, Cuba	451	268
Jan. 30	Nor. S.S. Clothilde Cuneo	Cienfuegos, Cuba (Coke)	399	....
Jan. 30	Am. S.S. Mineola	Bahia, Brazil	3,350	....

COAL AND COKE NEWS

Harrisburg, Penn.

Sweeping amendments to the Compensation law, are planned by the State Federation of Labor, representatives of which body were in conference on Feb. 5, with Representative David Fowler, and floor leader, for the United Mine Workers. The amendments will be contained in one bill which was scheduled to be introduced in the house during the week of Feb. 10 by Mr. Fowler.

Chief among the amendments will be the increase of compensation to two-thirds of the wages. Under the present law, 50 per cent. is paid. At present compensation commences on the 15th day the person is away from work on account of injury, and from that time on an allowance of 50 per cent. of the person's wages is allowed as compensation. It is proposed to reduce this time to seven days.

It is also proposed that a stipulated number of weeks be allowed for the loss of fingers, toes or ears. At present compensation is allowed for only the time required for the specific injury to heal. According to the labor men, a stipulated number of weeks is allowed for loss of fingers, toes and ears in the provisions of the compensation law now in effect in New York State.

Following a conference at the capitol on Feb. 4, between Governor Sproul and a delegation of business men from the anthracite region, announcement was made that a bill, regulating the anthracite coal-mining industry in the state and aimed particularly at the conditions that exist in Scranton and Lackawanna County, will be introduced in the Senate by Senator Albert Davis. The bill carries with it a maximum penalty of $5000 in fines and one year imprisonment. The bill is wide in scope, taking in any possible damage that can be done by surface subsidence caused by mining operations. Some years back, Mr. Davis, then a representative in the House, fathered the "Davis Mine Cave Bill," providing for the protection to streets and thoroughfares.

Charleston, W. Va.

Production in the Pocahontas and Tug River districts advanced from 365,000 to 390,772 tons during the week ending Feb. 1. This was due in part to a slight improvement in the demand for Pocahontas coal. Labor shortage is still running rather high, having caused a loss of 22,360 tons, other sources of loss in production being negligible. The fact that tonnage produced in the two districts has almost reached 400,000 tons indicates a decided improvement in the Pocahontas region and some revival of the demand for smokeless coal.

A generally dull market has been reflected in the large number of mines which are either shut down or are being operated very irregularly in the Fairmont region. On Saturday, Feb. 1, the number of idle mines amounted to 174 as against about 150 for the previous week. While mines were idle, there was no diminution in the car supply, the daily supply running well over 3000 a day. The amount of coal loaded, however, was far below that, loads running not over five or six hundred a day, with few loads going to the West. Orders here and there, however, were regarded as being an encouraging sign and as reflecting a somewhat improved demand. Railroads, however, are still holding off on fuel orders, and this of course has restricted production somewhat.

In the Kanawha district there has been little change in conditions. If anything, it was duller as far as marketing coal was concerned, during the week ending Feb. 1, than it had been even in previous weeks. While smokeless coal in other districts showed sporadic spurts, there was nothing to stimulate production in the Kanawha district, the market being extremely dull. Prices, on the other hand were holding up well. In the absence of any special demand for coal, the car supply was plentiful. Owing to the flat market, a large part of the mines were not operating or else were being operated during only a part of the week. The total net tons produced was 84,452.

In the New River field there was little change in conditions during the week ending Feb. 1, extreme dullness characterizing the demand for New River coal. However, there was an advance in price despite the fact that the market was so lifeless. New River producers are confident that there will be a resumption in the demand for smokeless coal before other kinds of coal show any improvement. The largest losses in production during the period already mentioned were due to no market.

New York, N. Y.

The Wholesale Coal Trade Association of New York, Inc., has taken up with Walker D. Hines, Director General of Railroads, the matter of demurrage charges on coal at tidewater and in a letter to Mr. Hines states that the present demurrage regulations provide for three days' free time at tidewater, averaged month by month, and $3 per day per car thereafter. The movement of coal over the railroads, the Association says, is so uncertain as to time that it is impossible to calculate with any degree of certainty whatever, when the whole or any part of a shipment will reach the port of transshipment.

Demurrage charges, the Association says, are intended to prevent abuse of equipment, and where the carrier has performed in reasonable manner its obligation of transportation, are undoubtedly proper and beneficial to the shipping public; but in the circumstances under which coal is moved to tidewater their principal effect is to place an additional burden upon the commodity which must be borne by the consumer.

The imposing of these demurrage charges is a discrimination against all users of coal who have to depend on getting their supply by the water routes from the railroad terminals. In addition to raising the price at all times, they will find it difficult to get a sufficient supply, except in time of depression, for the reason that the risk of loss to shippers is so great that they will not send coal to tidewater if they can sell it elsewhere.

The Association believes that transportation charges and penalties should take into consideration the conditions surrounding the handling of a commodity, and those conditions at tidewater for the transshipment of coal are such that unless there is relief in respect of demurrage charges at the ports the result will be to defeat the very purpose of those charges—that is, the quick release and return to the mines of coal carrying equipment—and force the sending of shipments all-rail, tending to longer employment of equipment and further congestion on all railroad lines.

PENNSYLVANIA
Anthracite

Pottsville—Seventeen of the "individual" mines, all shippers via the Reading Ry., are idle in the Schuylkill region. The reason assigned is that they are up against it because of a glut in the market and no place to store the product. All the Reading Coal and Iron Co.'s collieries are in operation with one or two exceptions. Great quantities of coal are being stored at Landingville and Abrahams.

Wilkes-Barre—A complaint against the alleged practice of the anthracite coal companies throughout the region in importing cheap labor from New York City and other Eastern cities will be introduced at the Conciliation Board, it was decided at a meeting of the tri-district board, United Mine Workers, held on Feb. 5. It was learned that the matter will be considered as a general grievance, and if not settled drastic action will be resorted to.

Lansford—Although many mines in the Schuylkill and Wyoming regions have either shut down or are working on reduced time, all the collieries of the Panther Creek Valley operated by the Lehigh Coal and Navigation Co. are still operating to capacity; and there are no indications that they will shut down or work on reduced time. A large proportion of the coal mined by the Navigation company is sent to New England markets via the Lehigh & New England R.R., which is controlled by the Navigation.

Hazleton—Coal operators of the Lehigh field who were interviewed on the curtailment of work schedules at the mines because of the slump in the market due to mild weather and the shutting down of munitions plants, were confident that the conditions would not last long and that the collieries will be back on full shift within four months. They discourage the suggestion that instead of cutting the time from eight to seven hours the mines suspend Saturadys and Mondays, as they fear the three-day holiday each week would give Bolshevik agitators a chance to create trouble among the idle men.

Scranton—Throwing more than 2000 experienced mining men and laborers out of employment, the Delaware, Lackawanna and Western R.R., Coal Department, on Feb. 4, officially closed its three largest collieries operating in this section. Two of the collieries, the Continental and Brisbin, will be abandoned and both breakers dismantled. The Bellevue colliery will close for an indefinite period, throwing 850 men into temporary idleness. The closing of both the Continental and Brisbin collieries will mark another interesting page in anthracite history. The two collieries were among the first operated in the Lackawanna Valley.

West Scranton—Following a dispute relative to the method carried out in the loading of cars, the People's Coal Co. has refused to further handle the output of the See-Rob Coal Co., and as a result the mine of the latter company is closed. Officials explain that the arrangement between the two companies provides that the People's company take charge of the See-Rob company when it reaches the foot of the plane leading into the Five-foot vein of the former company. Certain phases of the contract have been broken, according to officers of the People's Coal Co.

Bituminous

Charleroi—The washeries of the Donald Nos. 2 and 4 mines of the Consolidated Coke Co., Grays Landing, Penn., are being rebuilt and equipped with the most modern machinery. H. R. Blackford, general superintendent, is in charge of the work.

Greensburg—Helen M. Bygate, of Pittsburgh, and J. Fred Kurtz, of Connellsville, have sold a tract of 167 acres of Pittsburgh seam coal to the Whyel Coke Co., of Uniontown. This undeveloped coal land is in North Huntingdon township, near Irwin. The consideration was $175,000.

Uniontown—Edward O'Brien has resigned as a member of the Mine Foremans' Examining Board of the 23d bituminous district, and on recommendation of Mine Inspector Richard Maize, chairman of the board, the Court appointed Joseph Forbes, of Grays Landing.

Waynesburg—Deeds have been recorded of sales in this county to the Cumberland Coal Co. They include 101 acres from Daniel M. Anderson for a consideration of $56,482.91 and the coal under a small lot in Jefferson borough from Malinda Alexander for $143.35.

Meyersdale—The bottom apparently has dropped out of the coal business in the Meyersdale region. Mine No. 4 of the Keystone Coal Co., was closed down recently, and many of the smaller mines such as Stotler, Schell, Meager and others along the Salisbury branch have been idle for several weeks, with no immediate prospects of resumption. The Atlantic Big Vein Coal Co., which operates the old Keystone opening, it is reported, has ordered its miners to remove their tools. It is said that there are at present more than 500 miners idle in the lower end of the Meyersdale region. The mines of the Consolidation Coal Co. in this section are operated only about half time. Many men are leaving the region and going elsewhere in search of employment.

WEST VIRGINIA

Eldorado—With the completion of its plant at this place, on the Coal and Coke Ry., the Foy Coal Co. is going ahead with mining operations, but is storing the coal so mined.

Clay—Having completed the construction of a siding to its lease of 1200 acres in Clay County, the Lima Coal Co. of Lima, Ohio, proposes to proceed with the construction of its plant with a view to the development of the coal under lease.

ALABAMA

Bessemer—The Gulf States Steel Co. is installing electric meters on the long hauls in its Virginia Mines, near here. Electrical machinery has also been placed to generate the power for the haulage and other units which will be operated by electricity in future. A new slope is also being put down to shorten the distance to the workings, which will enable an increased production to be obtained from the mines.

KENTUCKY

Mayking—The Pine Creek Lumber and Coal Co. plans development of timber and coal properties near Mayking, one of the new coal districts of the state. T. L. Tackett, of Enterprise, Ky., and E. R. Hay, of Winchester, Ky., are the principals in this concern.

High Splint—W. R. Grant, of Pittsburgh, Ky., has leased 500 acres of coal land from the Cooper Ridge Coal Co., of Evarts, Ky., and plans development. The Cooper Ridge Coal Co. recently increased its capital to $75,000, for the purpose of developing properties at High Splint.

OHIO

Lisbon—Extensive development of coal lands in Columbiana County is planned by the Glenwood Coal Co., recently formed by M. L. Gailey and John T. Harrington, both of Youngstown. The deposits are located four miles from Lisbon.

INDIANA

Hammond—A new coal bunker, 200 ft. wide, 1600 ft. long and 25 ft. deep, is being installed at the Whiting refinery of the Standard Oil Co. It will have a capacity of more than 125,000 tons of coal.

Bicknell—Mine No. 1 of the American Coal Mining Co. at this place, hoisted 6123 tons of coal in eight hours, filling 128 railroad cars. The American mine, which is owned largely in Terre Haute, Ind., and Brazil, Ind., some time ago set a record for hoisting 5911 tons of coal in eight hours. A few weeks ago an Illinois mine loaded 6008 tons in eight hours. The achievement of the Bicknell mine places it 120 tons in excess of the Illinois mine.

Belleville—Damage to the extent of between $3000 and $4000 was done to the engine room and the gas engines of the Southern Coal and Mining Co. in the Little Oak mine Feb. 6, as the result of an explosion of gasoline. The fire was confined wholly to the engine room and was soon extinguished, but not until two expensive gasoline engines had been badly damaged. The lives of twelve men were jeopardized by the explosion and seven men had considerable difficulty in escaping. About 300 employees were idle for two or three days until the damage was repaired.

ILLINOIS

Danville—The Brady Branch mine, near Tilton, is contemplating several improvements, as it is expected the Wabash R.R. will build a switch to the dump mines and extend an incline from the ravine to the top of the hill. About sixty men are employed at the Carbon Hill strip mine, north of Tilton, and work has been exceptionally good until within the past few weeks. At the Brady Branch mine 150 men are employed.

Divernon—Divernon miners of the Madison Coal Corporation mine are reported to have broken the Sangamon County coal-hoisting record, with 1051 cars in six hours and eight minutes.

Litchfield—In consequence of much hardship because of the closing of the two mines in Witt, near this city, the residents of the village have presented a petition to Congressman Wheeler asking that he take up the matter with the proper authorities with a view to having the mines reopened. The closing of the mines in Witt in 1916 and the subsequent closing of all of the grocery stores in the village except one, caused the residents to appeal to the state charities for assistance. The people of the village are attempting to prevent a repetition of the conditions prevailing two years ago.

Springfield—All coal mines of central Illinois not under contract are now running only two days a week because of the warm weather and decreased fuel consumption.

Benton—The Pond Creek Coal Co., popularly known as the "Bobby Dick Mine," has been sold to a Chicago firm of coal operators, who will operate it under the name of the Freeman Coal Mining Co. This is one of the best small mines in the Benton territory and has been a prosperous property. The mine is located in Franklin County, and according to the last fiscal year mined for the year nearly 300,000 tons of coal.

ARKANSAS

Hartford—The Central Coal and Coke Co. has taken over the old Prairie Creek No. 34 mine at Hartford and is developing an up-to-date operation. Complete new equipment has been installed, as the mine was practically destroyed during labor troubles some time ago. The estimated capacity of the mine is to be 2000 tons per day. Construction and rehabilitation work is under the supervision of John A. McCurry, who will also be superintendent of the operation.

OKLAHOMA

Lehigh—The Oklahoma Mining and Stripping Co. will finish its mine at this place within a short time. A 6-yd. Bucyrus shovel is being used for stripping the overburden and two 3-yd. draglines for loading coal. The company is also developing a slope mine near Lehigh, and later on expects to start work on another.

Foreign News

Sydney Mines, N. S.—The Nova Scotia Steel and Coal Co. plant was closed down temporarily on Feb. 3. Four batteries of coke ovens will be kept in operation and the remainder allowed to cool off. During the suspension of operations the open-hearth and blast furnaces, stoves and coke ovens will be dismantled and undergo extensive repairs.

Personals

William Reid has resigned as mine foreman for the Dor-Mar Coal Co. at Savan, Penn.

H. C. Drum, formerly inspector, has been made assistant general manager of the Consolidated Coke Co., Grays Landing, Penn.

W. L. Fisher, formerly with the Consolidation Coal Co., at Jenkins, Ky., is now chief engineer of the Consolidated Coke Co., Grays Landing, Penn.

Frank Christopher, of Steyer, Md., has been appointed superintendent of the mines of the Diamond Coal Co. on Scott's Run, Monongalia County, succeeding C. W. McDowell.

W. Kinter has resigned as superintendent of the Locust Colliery Co., operating mines at Locust, Penn. He is succeeded by **J. Woods**, formerly mine foreman for the Pittsburgh Gas Coal Co., at its Whiskey Run mines at West Lebanon, Penn.

Lester E. Armstrong has accepted a position as advisory engineer with the Powdered Coal Engineering and Equipment Co., of Chicago. Prior to his service in the air branch of the army, Mr. Armstrong was associated with Babcock & Wilcox.

C. F. Ice, having completed his duties as chief of the division of inspection of the office of the district representative of the U. S. Fuel Administration for the Fairmont region, has again taken up his duties as the general inspector of the Consolidation Coal Co.

John F. Nealis, who recently received his discharge from the aero observation branch of the service, is now associated with the Powdered Coal Engineering and Equipment Co., of Chicago, as advisory engineer. Mr. Nealis formerly had charge of research work for the U. S. Steel Corporation.

J. M. McHugh, of Birmingham, Ala., who has been superintendent of the Edgewater Mine of the Tennessee Coal, Iron and Railroad Co. for a number of years, has been appointed general superintendent of coal mines for the same company, having jurisdiction over all operations in the Birmingham district. Mr. McHugh succeeds John F. Meagher, who died Jan. 16.

Lucius W. Robinson, for many years president of the Rochester and Pittsburgh Coal and Iron Co. and its subsidiary companies, has retired from the active business and operating end. **B. M. Clark**, former vice president in charge of operations, has been made president to succeed Mr. Robinson. **F. M. Fritchman**, general manager of the companies, has been given Mr. Clark's post as vice president. No successor to Mr. Fritchman as general manager has yet been named.

Industrial News

New York, N. Y.—The K-B Pulverizer Co., manufacturer of the crusher familiarly known as the "K-B," recently removed from its former address, 86 Worth St., to 70-72 Worth St., New York City.

Charleston, W. Va.—A bill has been introduced in the West Virginia legislature providing for an increase of $2000 per year in the salary of the chief of the mine department, making a total salary of $5000. The bill also carries increases of $900 per year to each of the deputy inspectors.

Birmingham, Ala.—At the recent session of the Board of Examiners held in the office of Chief Mine Inspector C. H. Nesbitt, there was a total of 68 applicants for certificates of competency as firebosses and mine foremen, 46 of whom passed the tests successfully, certificates being issued to nine who qualified as fireboss, five as second-class mine foremen, and 32 as first-class mine foremen.

Fairmont, W. Va.—A meeting of creditors—the first one—of the Initial Coal Co., which was declared bankrupt a short time ago, was held on Saturday, Feb. 1, to elect a trustee. Clarence D. Robinson, of Fairmont, a well known coal operator, has already been appointed receiver, qualifying under $25,000 bond. The assets of the company are in the neighborhood of $200,000, with liabilities considerably less. The operation of the company is in Barbour, the offices of the company being in Fairmont.

Birmingham, Ala.—Adams, Rowe & Norman, Inc., is the title of a new corporation, with offices in the Brown-Marx Building, which will devote itself to exporting and obtaining new markets for Alabama coal. Composing the new organization, which has a backing of millions of dollars, are W. Carson Adams, manager of sales of the Alabama Fuel and Iron Co.; G. J. Rowe, vice president and treasurer of the Yolande Coal and Coke Co.; and J. A. Norman, vice president of the Bonnyman-Norman Coal Co.

New York, N. Y.—Notices have been received from the United States Fuel Administration stating that monthly reports from distributors of anthracite and bituminous coal and coke on Forms A, B and C, from Pennsylvania anthracite to operators or sales agents on Form OA, and from railroad coal companies on Form 6, will be discontinued by the Bureau of Investigation, United States Fuel Administration, beginning Feb. 1. Reports of all shipments made during the month of January must be mailed promptly within the time required.

Pittsburgh, Penn.—An enthusiastic meeting of the coal-jobbing interests of Pittsburgh and vicinity was held in the ballroom of the William Penn Hotel on Monday, February 3, which was in the nature of a dinner in honor of George H. Cushing, Managing Director of the American Wholesale Coal Association. About 130 coal jobbers and their operator friends were present. Owing to the illness of A. R. Hamilton, of A. R. Hamilton & Co., who had been selected as toastmaster, it was necessary for Ira E. Bixler, president of the local association, to act in his stead. Mr. Bixler made a brief address of welcome and urged upon those present the necessity of organization, calling attention to the fact that the other branches of the industry had in the past outstripped the wholesalers and that it was necessary for them to protect their interests even as the retail dealer and producer had already succeeded in doing. Mr. Cushing addressed the meeting at considerable length regarding various phases of the present situation in the coal business.

Cincinnati, Ohio—The consolidation of ten operating and marketing coal companies into a single corporation to be known as the Hatfield-Reliance Coal Co. of Ohio, has been effected here by the Fleischmann-Hatfield interests. The new company will have an authorized capitalization of $3,000,000 preferred and $4,000,000 common stock, but it is understood that of this total of seven millions of stock only $3,700,000 will be issued just now. The companies affected are the Reliance Coal & Coke Co., of Cincinnati, and the Hatfield Coal Co., of Covington, Ky., both of which have large distributing organizations; the Lincoln Coal Co., Glomawn Coal Co., Hazard Junior Coal Co., all of Perry County, West Virginia; Reliance Coal & Coke Co., Reliance Iron and Coke Co., Licking Valley Coal Digger Co., West Virginia Workers' Coal Co., Plymouth Coal and Mining Co., all of West Virginia; and the E. J. Hickey Transportation Co., operating boat and barge lines. Pending the completion of the merger, with the election of new officers for the consolidated company, meetings of several of the companies involved were held in Cincinnati on Feb. 4, when officers were elected. The company will organize an extensive distributing system throughout the Middle West to market the large production which it will control.

MARKET DEPARTMENT

Weekly Review

No Life to Coal Market—Many Operations Shut Down—Soft Coal Prices Maintained, While High-Grade Varieties Are Advanced in Price—Await Outcome of Railroad Fuel Argument—Plenty of Anthracite.

THERE is no activity in the coal market. A noticeable feature, however, is the fact that the relinquishment of Government control, instead of resulting in lowered coal prices, has brought about an increase in price of the high-grade bituminous coals. Coal mined in Franklin County, Illinois, has advanced twenty cents a ton, while sales of West Virginia smokeless coals are being made at forty cents above the last-fixed Government price.

So extremely dull is the demand for all kinds of coal that hundreds of operations have been shut down, pending a revival of buying. No such revival is expected much before the first of May, when it is believed that consumers who have been using up their reserves will again be forced to come into the market. The shutting down of the mines has served to tighten the condition of the market, and it is not at all improbable that other grades of coal besides those already referred to will increase in price before the month is out. Wherever sales are reported at considerable concessions from the Garfield prices, investigation discloses that the coals so sold are in small lots and of an inferior grade.

Little contracting is reported for future requirements, the general tendency of large consumers being to await further developments. Another deterrent to active contract inquiry is that the question of what price the railroads are to pay for fuel has not yet been decided definitely. It is understood that the railroads insist on getting their coal supplies at a price out of all proportion to the costs of production, and that the national soft coal operators' association has taken the matter up with Director General Hines.

In years gone by the railroads, by many unfair practices, were enabled to buy their coal for far less than the cost of producing it. The operators, in order to avoid a loss, as a consequence were obliged to raise the price of coal to the public. This the operators refuse further to do, and the outcome of the conferences with the railroad head is being eagerly awaited.

Production of soft coal is still on the decline, the output of the bituminous mines during the week ending Feb. 1 being estimated at 8,345,000 net tons.

The continued prevalence of good weather has caused many of the collieries in the anthracite region to suspend indefinitely. Both dealers and consumers have plenty of coal on hand, and cancellations and suspensions of deliveries are the order of the day. Steam as well as domestic sizes of hard coal are plentiful, though there is less of the former coming to tidewater now because of the falling off in demand.

The output of anthracite coal during the week ending Feb. 1 is estimated at 1,821,000 net tons, exceeding production during the same period of 1918 by 57,000 net tons.

WEEKLY COAL PRODUCTION

Bituminous—The third successive week of decreasing production was recorded during the week of Feb. 1 when the output of bituminous coal declined to the lowest level during the past few years with the exception of Christmas week of 1918. The production during this week is estimated at 8,345,000 net tons and is 893,000 net tons below the production of the week of Jan. 25 and 1,271,000 net tons below the week of Feb. 2 of 1918. The average production per working day during the week of Feb. 1 is estimated at 1,391,000 net tons as compared with 1,872,000 net tons, the daily average for the coal year to date, and 1,744,000 net tons, the daily average for the same period of last year. The production for the coal year to date now totals to 494,081,000 net tons as compared with 460,417,000 net tons for the period Apr. 1, 1917, to Feb. 2, 1918.

Anthracite—Anthracite production during the week of Feb. 1 is estimated at 1,821,000 net tons, a decrease compared with the week preceding of 65,000 net tons, but exceeds production during the same week of last year by 57,000 net tons. The daily average per working day is estimated at 304,000 net tons and for the coal year to date at 312,000 net tons, compared with 317,000 net tons for the same period of last year. Total production for the coal year to date is estimated at 82,363,000 net tons and falls behind production of last year by 1,311,000 net tons.

Carriers' reports for the week ended Feb. 1 show that decreases occurred in all fields, compared with the week preceding. In the central Pennsylvania fields the decrease in cars loaded amounted to approximately 4600; in Ohio to 1700 and in the district including Illinois, Indiana and western Kentucky to 3011.

New England Shipments—Bituminous coal movement to New England continued on the downward grade during the week of Feb. 1, being estimated at 299,308 net tons as compared with 344,112 net tons during the week of Jan. 25. This decrease occurred in both rail and tidewater movements, all ports reporting a falling off in the tonnage loaded.

Tidewater Shipments—Shipments of bituminous coal from the north Atlantic ports and Hampton Roads during the week ended Feb. 1 are estimated at 667,206 net tons and fall behind shipments during the preceding week by 16,788 net tons. Baltimore was the only harbor to report an improvement over the week preceding, while New York and Philadelphia fell behind slightly. The Hampton Roads shipments also fell behind, the decrease at this port amounting to 16,577 net tons.

Beehive Coke—The production of beehive coke in the United States during the week ended Feb. 1 is estimated at 529,000 net tons as compared with 575,000 net tons during the week ended Jan. 25, and as against 468,000 net tons during the same week of 1918. The operators in the Connellsville, Greensburg and Latrobe districts of Pennsylvania report production during the week ended Feb. 1 at 295,253 net tons, and the operation of their plants at 75.2 per cent. of full time compared with 74.6 per cent. during the week ended Jan. 25. Improvement is noted in labor conditions. The same operators produced 141,400 net tons of coal.

Byproduct Coke—The production of byproduct coke in the United States during the week ended Feb. 1 is estimated at 554,639 net tons and while approximately 10,000 net tons below the production of the week preceding, exceeded production during the corresponding week of 1918 by 188,000 net tons. The plants of the country were operated at 84 per cent. of their full time during the week as compared with 85.5 per cent. during the week ended Jan. 25. The loss of capacity amounted to 16 per cent. during the week of Feb. 1 and is due to repairs to plants which amounted to 6 per cent. and lack of business which amounted to 5.8 per cent. as compared with 1.4 per cent. during the week previous. Operating conditions changed but slightly in the various states, lack of market being reported for the first time by the operators in Alabama and increased losses of capacity occurring in all the districts reporting lack of market as the limiting factor.

BUSINESS OPINIONS

Marshall Field & Co.—Current wholesale distribution of dry goods is running somewhat less than for the corresponding week of 1918. Road sales for immediate delivery were about the same, compared with the corresponding period a year ago. Our road salesmen are not offering fall lines as yet. Many more merchants are in the market at this time than in recent years, replenishing stocks depleted by excellent retail business. Collections continue excellent.

The Iron Age—Urgent needs are bringing forward delayed buying by the railroads. Besides cars and locomotives, 500,000 tons of rails are counted on. Some rail mills are without orders and none has more than four or five months' bookings. On foreign account 62 locomotives have been sold for Africa and Argentina. Car builders are expecting a release on 20,000 cars for France postponed on the cessation of hostilities. German steel output according to the London cable was about 16,500,000 tons in 1918 or about the same as 1917. A big Continental rail and construction material demand is reported.

Dry Goods Economist—The attitude of labor has engaged the attention of distributors and manufacturers of textiles this week almost to the exclusion of problems more directly connected with merchandising. In numerous and widespread centers operatives have quit work in the effort to enforce their demand for shorter hours with no reduction in wages, while in a few cases the operatives want not only shorter hours but an actual increase in pay. In some cases the operatives' refusal to withdraw their demands was answered by the closing of plants. In few instances have the operatives' demands been granted.

Dun's—Of disquieting features, the existing labor troubles, notably those in Eastern textile centers, are conspicuous, and the percentage of idle machinery has stead-

ily risen, either because of strikes or from the slow development of new orders to replace the expired or canceled Government contracts. Very heavy payments through the banks, as reflected in Clearing House transactions at the principal cities in the United States, continue the rule, total exchanges this week amounting to $6,255,465,712, an increase of 23.3 per cent., as compared with this week last year, and of 0.2 per cent., as contrasted with the corresponding week in 1917."

Bradstreet's—Some important branches of the woolen industry are reported firmly established on the newer basis of time run. Overtime in industry and on the railroads has definitely ended, but reports from steel mills, particularly at the West, is that the wheels are beginning to turn faster in answer to calls from new domestic business. Export trade has livened up a little in lumber, leather, and provisions, but iron and steel are declared to still lag in this respect. In distributive trade, while the general report is that affairs as a whole are still at a waiting stage, there are signs that Spring distribution, especially at the West, is a trifle more active, not so much in textiles as in shoes, millinery, hardware, agricultural implements, and building materials.

Atlantic Seaboard

BOSTON

Situation continues hopelessly dull. More and more difficult to absorb water-borne coal. Operators find situation here hard to understand. Lower rates on barges but no business. Steamer rates unchanged. Action on railroad fuel eagerly awaited. Pennsylvania shippers have ample contracts on file but shipments suspended to such extent that shutdowns are beginning to be the rule. Mills under heavy curtailment. Outlook anything but encouraging. Bottom has fallen out of anthracite market. Retailers put out 50 per cent. normal or less. Many shippers without orders. Price reduction general in Boston.

Bituminous—The current situation here is without any relieving feature. There is now practically no buying interest whatever, and as the season advances the trade realizes more keenly how far off is any material improvement. The current market is simply stagnant and the merest nibbles on the part of buyers are signals for the closest of figuring. Unless for special reasons a purchase is contemplated there is no buying at all. For more than 90 per cent. of the steam-users of New England a very substantial cut in current prices would be no inducement, so heavy are current stocks and so little faith is there in the future of the market. This has been proved time and again the past month, when both all-rail and at tidewater sacrifice offerings have been made in the effort to dispose of distress coal. As low as $1.50 per net ton has been heard on some of the West Virginia grades that are accessible to New York ports and where coal had to be moved in order to obviate heavy demurrage charges under the new rules in force with the Tidewater Coal Exchange. The outlook is for a hopelessly dull market throughout the spring.

The tidewater market is practically bare of inquiry. The regular shippers who normally have staple trade throughout the season are facing almost complete shutdowns at the mines in addition to the steamers under charter that must remain tied up for an indefinite period while the Shipping Board collects its monthly dues on Government form of charter. So difficult is it now for this territory to absorb cargo coal that factors with market coal on their hands are at loss which way to turn. It is reliably reported that a price alongside that is less than the f.o.b. figure at Hampton Roads was the only offer obtainable on such a cargo a few days ago, and at that the barge would have to wait several days for space to be made through daily consumption to take on the coal. In other words, prices have to be shaded nearly $3 per ton in order to induce the purchase of a single cargo, and that illustrates the state of the market in this territory at this writing.

Rates on barges from Hampton Roads that were quoted at $3.50 in the midst of the stringency last summer are now to be had at $2.75 even to points east of Boston, but the modification has little significance because there is such a dearth of inquiry. There is an accumulation of boats at practically every port because charters are so hard to place. Meanwhile steamer rates under the jurisdiction of the Shipping Board are unchanged and there is apparently no prospect of change until Apr. 1, if then. A few of the steamers heretofore in coastwise trade have been chartered to Cuba and to South America, so that today there are probably not so many steamers actually laid up as was the case a fortnight ago.

The attitude of the railroads has always been a big factor in the New England market, whether the latter is dominated by buyer or seller, and this year will probably be no exception. The trade is eagerly looking forward to a decision by the Railroad Administration on this complicated matter, but to judge from the reserves being carried by New England roads and the bargain-counter offers being made them by shippers who have coal they must move the matter is likely to be viewed much less urgently by the railroad authorities than by the coal interests.

Most of the Pennsylvania operators who have regular connections in this market have ample contracts on file, but the latter are useless at this writing because so generally have the consignees been supplied through other channels. Then too, consumption was estimated last year on a war basis and on the basis of a normal winter, and now with abundant water power and widespread curtailment it is physically impossible for a very large number of plants to increase their stocks even if there were an object in doing so. $2.30@2.40 is being freely quoted per net ton on medium-grade coal f.o.b. mines in central Pennsylvania but no business of any moment is reported. On the other hand an increasing number of mines have practically ceased operations. The movement of these coals into New England seems certain to diminish through February and March. No comprehensive business is being looked for now until June, at the earliest.

Anthracite—As orders are filled there is no new business to take their place. There are several houses here who have no unfilled orders on their books. The bottom has certainly dropped out of the anthracite demand for all sizes. The relatively few shipments that are being made contain a large proportion of stove and chestnut, apparently the only sizes that the public is at all interested in taking on. Retailers in all directions report that trade has fallen off at least 50 per cent. and that it is increasingly hard to find consumers willing to accept deliveries. For the most part the last "third" which retailers were restrained from delivering during the summer and fall has proved a myth and does not exist. The extremely mild winter has something to do with it, of course, but the psychology of the situation had also much to do with it.

The retail dealers of Boston reduced prices on Feb. 5 from $12 on broken egg, stove and chestnut to $11 for these sizes, $10 being the new price for pea. By this move the dealers acknowledge there was some ground for the reduction made by one of their number some weeks ago, the announcement of which attracted widespread attention.

NEW YORK

Demand for anthracite nearly at a standstill. Orders scarce and many individual operations reported as closed temporarily. Yards have sufficient supplies for several weeks. Company prices for the domestic sizes prevail. No change in mine prices expected. Bituminous situation quiet, with plenty of coal to meet all needs. Production greatly curtailed and many miners idle. Many loaded boats in the harbor.

Anthracite—There has been no improvement in either the wholesale or retail markets. Demand is practically at a standstill and orders have become so scarce that many of the mines are operating on half time or less. Several of the smaller operations, it is reported, have temporarily closed down entirely due to the lack of demand.

Locally the situation is bad. There is plenty of coal to be had but no buyers. Everybody seems to have sufficient supplies to last until Mar. 1, even if the weather should cause a heavy consumption, and there is no disposition on the part of retail dealers to do any more buying at present.

The differential between the Individual and Company prices no longer exists so far as buying is concerned, as the smaller operator realizes that he can secure orders now only by meeting the company terms.

Nothing definite has been announced concerning the rumor that mine prices might be changed. Some coal men do not expect any change from the present prices, at least not until Apr. 1, and then there are others who believe that instead of the differences between the two prices being equalized there will be the usual spring discount of 50c. per ton. On the other hand there are many who would not be surprised if there were no spring discount. However, no definite announcement is expected for several weeks to come.

The demand for domestic sizes is stagnant. There is no call and the surplus is heavy. Shipments to this harbor continue to average up well with those of previous weeks. Dumpings for the seven days ended Feb. 7 were 5014 cars as compared with 4569 cars the previous week, an increase of 445 cars.

Dealers are not inclined to buy heavily at this time, preferring to reduce their stocks rather than to carry over into the new coal year a lot of high-priced coal. A few days of real winter temperature would, however, stimulate the market.

The demand for the anthracite steam sizes shows no improvement, but the market is stronger because of the suspension of operations in many of the mines, causing smaller shipments. Many operators are taking advantage of the present situation to store these coals, and this tends to decrease the tonnage sent to tidewater. Quotations in Individual coals vary, with heavy concessions heard of rice and barley. Pea coal is practically unsalable, many shippers, according to report, asking for offers. There is no demand for it and the supply is large.

Bituminous—Even with the market quiet the situation is well in hand. With similar conditions existing a few years ago it would be expected that the market would be over-run with coal, but no such condition exists now. There is plenty of coal here to meet all requirements, but the surplus is not so large as to cause a break that would result in mines being willing to practically give their coal away.

Operations have been curtailed and the result has been that the market is not overburdened. One hears of certain grades being offered at concessions below what was the Government's maximum, but that was expected by many shippers. For the high grades these concessions are not so large as for the cheaper coals. This may be due to the demand of large consumers for high-grade coals and the continuance of the Government to take good-sized tonnages.

Operators are not disposed to take orders for Clearfield coals at lower prices than from $2.60 to $2.75 at the mine. They are taking into consideration the cost of production and rather than operate at a loss are inclined to suspend mining until the market is in better condition.

Lack of demand has already been felt in the mining regions and many mines have either been closed down temporarily or are working on a curtailed schedule. In the Fairmont regions it is reported that many thousand mine employees are idle because of the lack of orders.

With the coal year drawing to a close the matter of contracts for next year is attracting some attention. There are numerous inquiries, but it is not likely that either operator or consumer will hurry the signing up for next year's supply. Neither side seems anxious to obligate himself with the market in its present condition. The consumer inclines to the belief that cheaper coal is possible while reports have it that the operator believes higher prices, especially for the best grades will be the rule. There are some consumers who believe that by waiting until about June before signing up for next year's coal they will be able to strike a bargain, while there are others who believe they will do better by buying in the open market.

There are many loaded boats in the local harbor, some of which it is reported have been offered at low prices in order to save demurrage charges. Gas coal is in good supply.

Dumpings of bituminous coal at the local railroad docks for the week ended Feb. 7 were 6779 cars, an increase of 592 cars over the previous week.

PHILADELPHIA

Retail prices for anthracite drop as result of removal of Government supervision over mine prices and surplus of coal. Local market continues quiet. Demand is slow and dealers are not inclined to fill up at present time. Stove and chestnut is heaviest call. Bituminous market "dead." Removal of price supervision makes no difference in local situation. High-grade coal wanted and consumers are willing to pay price.

Anthracite—The removal of the Government regulations of prices on anthracite has resulted in a drop in retail prices in this city, the reduction varying according to size and the proportion of coal purchased by the dealer from individual operators.

The market is quiet. Demand has dropped and buying is slow. Most of the dealers have their bins filled and do not expect they will have to make heavy purchases until spring.

The heaviest call is for stove and chestnut, and this is limited and hardly makes a dent in the stocks available for shipment by the operators. Movement of egg and pea is slow, and shippers find themselves overstocked with these sizes. Reports from nearby counties indicate a better demand than in this city, with prices for individual coals stiffer.

With everybody complaining of the quantity of domestic coals on hand, the supply of the steam sizes is even greater. The curtailed receipts due to the closing down of numerous mines throughout the regions are more than sufficient to take care of all immediate requirements.

Reports from the coal fields indicate a heavy suspension of mining, and unless demand increases a further curtailment may be necessary. On Friday of last week it was reported that 17 mines in the Schuylkill region were idle because of the glut in the market. It was also reported that some of the railroads were considering the laying-off of some train crews because of the lack of shipments.

Bituminous—The situation has not been changed to any great extent since the first of the month when the price supervision was removed by Governmental order. The demand is slow and the supply of coal on hand large. While concessions have been heard of, they are not made for large lots.

Most consumers having plentiful stocks on hand are willing now to buy only high-grade coals and for these are willing to pay substantial prices. The cheaper coals are not in demand unless the buyer is hard pushed and has been unable to secure the better qualities.

BALTIMORE

Soft coal market remains heavily overstocked, and prices on forced sales are much off old Government maximum. Anthracite in plentiful supply, and some dealers hard pressed to find places to put it. Independents offer inducements.

Bituminous—The bituminous market here is more than liberally stocked at present. It is hard now for mines to place any but the better coals. The tidewater terminals are all jammed with loaded cars. Some forced sales in this market are being made much off the old Government maximum. For the first time there was talk of offerings of fuel around the $2 mark, the coal thus pushed being from the Fairmont district. The less desirable coals running on pool No. 18 here too were offering cheap in many cases, and some sales were recorded on a mine basis of $2.20. Better grade coals generally ranged all the way from $2.50 to $2.75 mine basis for the most part. An effort is being made to clean up the congestion here by placing the coal with plants that can store a little more ahead. It may take a few weeks, however, to get things so far straightened out as to give a healthy market again. Numerous mines remain closed, and there is some talk of labor uneasiness as a result. Labor in some sections is finding it hard to understand that high wage scales do not necessarily mean continuous work.

Anthracite—Hard coal has poured in liberally of late and dealers here, in the face of the light demand due to the continued mild winter, are in some cases hard put to find outlets. Some with limited yard capacity have coal awheel that they do not know what to do with. Dealers who are well stocked now are cautious in ordering as they fear being caught by a change of prices at the mines. There has been talk that the company mines may advance rates 25c. to 50c. and that the independents will then sell at the same rate. As a matter of fact independents are already offering inducements for orders, waiving in many cases the 75c. difference allowed by the Government formerly, and agreeing to sell from Feb. 1 at any rate that may be established by the company mines. Retailers are moving slow in all purchasing, however, and the market is generally listless.

Lake Markets

PITTSBURGH

Asking prices on Government basis. Scarcely any contracts. Demurrage coal at cut prices. Operations at 30 to 35 per cent.

The advanced prices published by Pittsburgh district coal operators, on the basis of $2.50 for mine-run, 15c. less for slack and 10c. more for ¾-in., proved not to be even a seven-days' wonder but rather a two or three days' wonder, and they are now practically forgotten. The asking price for mine-run is $2.35, the former Government maximum, but bids at less are frequently accepted, particularly in the case of coal on track and requiring immediate sale to avoid demurrage. Demand is so light that such coal is an important market influence, though the quantity involved would be quickly absorbed in a market of normal dimensions.

Operators are looking for the curtailed output—30 to 35 per cent. of capacity—and a growing demand from consumers to right the situation and put the market on a steady basis. They insist that cost of production at the lowest cost mines is not much under the Government figure and at many small mines is above it, also that no one is going to sell coal at a loss. Buyers do not regard arguments based on cost figures as conclusive, and accordingly are holding off.

The contract season is on, but scarcely any contracts are being made. One contract, however, is definitely reported, 3000 tons monthly of ¾-in. gas coal over the twelvemonth at $2.60, the full Government limit. The contract probably represents the exception rather than the rule. It is improbable, however, that there will be much shading of prices in the case of contracts, for a time at least, but spot lots that must be moved may go at any figure.

The market is quotable at about the following range, depending largely on grade, but the higher figures being fairly well maintained as asking prices on contracts: Slack, $2@2.10; mine-run, $2@2.35; ¾-in. gas, $2.45@2.60, per net ton at mine, Pittsburgh district.

TORONTO

Market quiet and featureless. Drop in price of anthracite. Industrial reconstruction slow. Bituminous little in requisition.

The coal market remains quiet and featureless, and dealers are doing little more than mark time. Such orders as are being received are mostly from the class of consumers who buy from hand to mouth. The price of anthracite has been reduced from $12 to $11.50 per ton, otherwise prices remain unchanged. There is no noticeable improvement in the demand for bituminous, the movement of which is likely to remain slow for some time to come. It is now fully apparent that industrial reconstruction, which was expected to take place rapidly, will be a gradual process, as but little actual progress is being made in that direction—manufacturers generally pursuing a conservative policy as regards projected changes and expansions.

BUFFALO

No improvement in coal situation. Anthracite orders being cancelled. Prices being held by shutting down mines. Jobbers find trade past managing. Prepaying freight charges.

Bituminous—The trade remains quite as dull as formerly. The weather has upset everything. Other industries as well as coal are disturbed by it, and trade is affected. The warm winter would have been welcomed a year ago, but now it has spoiled all sorts of calculations. Consumers of coal are using less fuel than they would in an ordinary winter. They have more coal on hand than they have any use for, and sometimes more than they can well store.

The mines are so far in command of the situation, for they shut down as often as the coal fails to sell. The new order, that does not permit the reconsignment of coal is likely to help the situation, so far as the mines are concerned, but it hurts the jobber; and he is badly enough off now. If coal must be shipped from the mine direct to the consumer it will not stand about waiting for a market. Buffalo has had little unsold coal on track this winter, and the little that was caught in that way suffered. Some of it sold for freight or even less.

Now comes the order to prepay the freight on all slack coal that is shipped into Canada by the Niagara or St. Lawrence River routes. This means that the shipper must put about twice as much money into the business as formerly, but it is done to protect the railroads from coal that is left on their hands. Some members of the trade see justice in it, though it will be opposed by all shippers. The dropping of the Government arbitrary prices has made no particular change in bituminous prices, which remain as before.

Anthracite—Distributors are still saying that consumers are not well stocked up here, but they are also aware that with a few days more of mild weather they will refuse to stock up at all, and will buy by the ton or two. There is still time for considerable winter, though not for any such winter as that of last year. At present many orders are being cancelled.

While the prices of anthracite are being held firmly by the railroad-controlled companies, the extra price allowed to the independents has been dropped, still the demand is light. Consumers complain that they must pay about twice what they did a few years ago, but it is easy to show that the cost of producing and marketing coal has also doubled lately. Word comes that preparations are being made for a still further advance in the freight rate, and possibly of the mine price also.

CLEVELAND

Prices of bituminous coal have stiffened, if anything, since Government control has been completely relinquished. The matter of price, operators declare, is entirely dependent upon the action of the Railroad Administration. More anthracite is being received, and a cut of 40c. in retail prices is due.

Bituminous—The larger operators have declared war on the "bolsheviks"—the smaller operators and jobbers who are undercutting prices. Asserting that price-cutting cannot stimulate business, and that it only weakens the indusry's contention that high labor and transportation charges have seriously impaired the margin of profit, the larger interests are refusing, as a whole, to make concessions and are spreading propaganda to this effect. The result has been smaller offerings of standard No. 8 coal underneath what was the Government maximum.

As has been the case for some time, mine-run can be had by "shoppers" for from $2 to $2.35. Most of this continues to be "car service" coal, in which the price is almost wholly a matter of bargaining between seller and buyer. The standard quotation on No. 8 coal remains $2.35. Contract coal is going at this figure, and the larger interests claim to be intending to stick to it until Apr. 1. Prices for the coming year will be regulated by the price the Railroad Administration offers, it is believed. As proof of this, lake coal will not be priced until the railroads take a stand. It is believed that if $2.35 is not maintained $2.15 will be the minimum offered.

Probably one-third of the normal tonnage of coal northern Ohio consumes now is coming into the district. Half-time now is a good average at southern and eastern Ohio mines. This is held not half bad in the light of adverse trade conditions. Mine workers admit they have no grounds for complaint, yet the idleness is not to their liking. No outright offers to shade the present scale are reported, but it would not be surprising if some operators sounded out labor on this proposition shortly.

From some quarters comes the advice that steam-coal users had best take advantage of the present lull and stock up in anticipation of protracted negotiations between operators and the mine workers when the wage scale question is opened. Whether this is sales-promotion talk or a sincere warning is difficult to determine. No sales for this reason are reported, for those who heeded the Fuel Administration's warning and laid down coal for this winter are willing to take their chances next time, they say.

The retail coal trade continues stagnant. Some Pocahontas is expected soon after Feb. 15, and it will be priced at $7.50 for the prepared sizes. It will compete with coke at $12.15 and West Virginia splint at $7.10. A fair demand for Pocahontas is anticipated, for long-time users say they will abandon substitute anthracite or bituminous at the earliest possible moment. Pittsburgh coal retails, delivered, at $6.35. The larger retailers have not yet reduced appreciably, though smaller dealers are offering job lots of "car service" coal at reductions of fom 50c. to $1.

Anthracite—Egg now is as plentiful as the furnace grades, egg retailing for $11.25 and chestnut for about $11.55. These prices will be reduced 40c. in a few days, the high-priced independent supplies being about exhausted. While anthracite is by no means plentiful, all the demand for it is being met.

Lake Trade—As the winter wears on and the dock piles at the head of the lakes melt much slower than usual, talk of a later opening becomes more prevalent. Few cargoes will be going up the Great Lakes before the first week in May, it now appears. Lake coal is being placed, but price is being deferred. Many lake shippers have now come out for restoration of the original demurrage rules, which provided seven days free time and demurrage thereafter at $1 a day. The free time has been cut twice—first to five days and then to three. At

three days individual shipping cannot be done, is the claim. The lake shippers' committee is awaiting word from Washington setting the date of the conference with the Railroad Administration in regard to demurrage revision.

DETROIT

With lower temperatures encouraging the hope for more active domestic buying, many Detroit retailers fear open market conditions will bring in a flood of coal, hindering sale of their heavy stocks.

Bituminous—Burdensome stocks of bituminous coal held by local industrial plants and by a large proportion of the retail dealers are still a source of uneasiness in the Detroit trade. Because of these stocks the volume of new buying is small. The users of steam coal are not cutting down the stocks on hand as rapidly as had been anticipated. Transition from war to peace conditions is accompanied by a general reduction of activity in manufacturing lines, due both to Government delays in settling accounts with the contractors.

A considerable part of the business now coming to jobbers and wholesalers is derived from the steam plants that customarily buy in small amount, practically on a hand-to-hand basis, because of their lack of facilities for storage. Prices are said to be holding fairly steady at the Government level, except in a few instances involving mine-run stock. One concern is reported to have sold some of this class of coal at about $5.60 delivered.

The problem presented to many of the retailers by removal of the Fuel Administration's restrictions is a serious one. Unsold stocks of bituminous fill their yards. A considerable part of it is rated as inferior in quality and much of the stock is mine-run, which the dealers bought when a more desirable coal for domestic use could not be had. Unusual weather conditions have prevented realization of the active demand that was expected. The dealers are still hopeful of getting this stock into consumers' hands if the weather will only remain cold long enough to stimulate buying. They realize, however, that their situation will be made precarious should shipments of a better quality of coal come into Detroit in any quantity.

Anthracite—Mild weather has made possible large conservation of the anthracite so far received and most of the dealers have a small supply on hand. Because of their desire to reduce troublesome stocks of bituminous, before the end of the coal year, it is probable no very strenuous effort will be exerted to bring into Detroit a larger amount of anthracite than the city's allotment from the Fuel Administration.

COLUMBUS

There is practically nothing doing in the coal trade. Business is at a low ebb, and there is little in the future to encourage the coal men. Steam stocks are large and retailers are only buying in small lots. Prices are still unsteady.

The coal trade in Ohio has now reached the lowest ebb in the memory of many of the older members of the industry. Demand is at a minimum, and little is expected within the coming month. The raising of the zone restrictions has not caused much demand for coal, as stocks were generally sufficient for the present. Some Pocahontas has been moving into localities where it was zoned out, but this is not expected to last for any time. Retailers are loath to increase stocks in view of the exceedingly warm winter. In fact they are inclined to wait until their stocks are quite low before replenishing. Retail prices are generally well maintained, but there is enough cutting to make the market unstable. Householders have sufficient stocks to go through the winter, and the indications appear that some will be carried over. Little anthracite is now coming into this territory.

The steam trade is quiet in every respect. Buying is limited to actual needs, which are small, as most of the larger consumers have stocks to last for several months. The change from war to a peace basis is not going on rapidly, and that is holding up the fuel business. Public service concerns have sufficient stocks of fuel, and the same is true of public institutions. In fact little is expected in the steam trade until after Apr. 1. Screenings are plentiful and cut prices for that grade are the rule.

Production is at a low ebb in all of the producing fields of the Buckeye state. This is due partly to lack of proper equipment. The railroads serving the Hocking Valley field have been robbed of their hopper cars and have an oversupply of huge gondola dump cars, which cannot be used in the domestic trade to advantage. Thus some orders are missed that might be filled otherwise. It is estimated that the Hocking Valley, Cambridge and Crooksville fields are now down to about 25 per cent. of normal. Pomeroy Bend is not much better off, and eastern Ohio is credited with about 30 per cent.

Prospects for the lake trade for the coming season are not as bright as in former years. This is due largely to the fact that a large tonnage will be carried over on the docks, and that ore shipments will be delayed. The opening is expected to be late.

CINCINNATI

Dullness continues to feature the entire market, consumption being largely from storage supplies or on contract deliveries. Competition for business will be keen during coming season.

The local market has not differed materially from its former status during the past week. The removal of the restrictions imposed by the zone system was greeted by the trade with considerable relief, naturally, as it opens a way for the return of business with the Middle West and more distant territories.

However, as already suggested, conditions just now are such that the return of this business cannot be immediately expected, as the same general conditions which have affected business in this immediate vicinity exist also elsewhere, and any large shipments of coal into the western markets would merely result in further complicating an already difficult situation.

Producers and agents here are preparing to go vigorously to work in their old territories, in order to secure for the future whatever business may be available to them. They understand fully the inadvisability of imparting a false stimulus to a dead market by means of drastic price-cutting, and it may be predicted that nothing of this sort will be resorted to; but every legitimate means of securing business will certainly be used in the coming month by concerns with production to dispose of, as a matter of course, and this means that the competition for 1919 contracts will be as keen as the trade has ever witnessed.

LOUISVILLE

Continued mild weather holding back domestic demand. Industries overstocked, general movement dull. Mines operating two to three days, with many small mines down.

There has been no material change in the general situation in the Kentucky coal industry during the week. Weather conditions are about the same as they have been for the past three or four months, resulting in retailers doing a light business. Industries are generally overstocked and are not buying.

Good domestic coal is in slightly better demand than other varieties, and numerous operators are getting 15c. per ton over former maximum prices for domestic. Steam coal, especially screenings, is hard to sell and is being shaded as much as 50c. a ton by many operators. It is claimed that the Southern markets are generally stronger than the Northern markets, where more price cutting is being done. South of the Ohio River the operators, retailers and jobbers are making a harder effort to maintain prices.

With the lifting of the zone regulations some operators are again able to continue shipments on old contracts, but the contracts are not of much advantage as the customers are stocked up on Fuel Administration coal.

It is claimed that a few operators have been shading contract prices slightly in order to retain good will of industrial consumers who are tied up on contracts, but as a rule an effort is being made to hold contract prices. Practically no new contracts are being made at the present time.

Eastern Kentucky operators who were practically out of the Louisville market in many instances during the past year are again making a hard drive for local business. The western Kentucky operators who had things almost their own way in Louisville are making a fight to hold their gains.

Many of the mines in both fields are down, some of the big western Kentucky mining companies only operating a part of their mines, and not full time in these. Few mines in eastern Kentucky are running more than three days a week, and any number of small mines are down indefinitely.

Railroads are practically out of the coal market, some roads even curtailing their requisitions from contract mines to 50 per cent. of the output. Under such conditions the mines without railroad contracts have no chance for rail coal business.

BIRMINGHAM

Steam trade in unsettled condition with little demand for spot coal. Government schedules being maintained as minimum prices. Strong domestic demand and short supply cause prices to advance.

Inquiries for steam coal in this market have been light for the past week and little new business has been booked. Consumers who are not tied up in contracts seem disposed to await the trend of affairs for a while at least, while producers have assumed an attitude of "watchful waiting" and are holding firmly to Government schedules in effect at the close of January. It is stated, however, that when the market again becomes active that there will be an advance in mine prices on some grades of steam fuel. Contract coal is moving normally.

The lifting of the ban on coal prices was followed by an advance of from 20 to 65c. per ton on domestic coal at the mines. The shortage in this grade of fuel, which has been in evidence since Apr. 1 last, still exists to a marked degree and there is an insistent demand for every ton obtainable.

The future of the trade is viewed optimistically by sales managers and brokers, and special attention is to be given to the establishment of markets for Alabama coal in the gulf ports and in the South American industrial centers, as announced by Adams, Rowe & Norman, Inc., Knox Conville, who for a number of years has been manager of sales for the Pratt Consolidated Coal Co., the largest producers of commercial coal in the district, and H. S. Hall, well-known in the local trade, have established a sales agency under the title of Conville & Hall, and will handle the output of the Pratt company and other mines in the district.

Coke

CONNELLSVILLE

Demurrage coke factor in spot market. No inquiry on contract. Old contracts under adjustment. Consumption and production decreasing.

While Connellsville coke operators have been endeavoring to curtail production to the continually decreasing demand, they have hardly been able to keep pace, and this has resulted in there being considerable tonnages of coke loaded on track and requiring shipping instructions to avoid payment of demurrage. Furnaces have been well supplied with coke, cars at stacks awaiting unloading and with plenty more on the way, so that it has been difficult to find a buyer for coke at any figure. There are prompt lots of furnace coke, or alleged furnace coke, offered at all the way from $4 to $5, and the usual claim is made that the lower priced material is not standard. Doubtless this is altogether true, for during the war a great deal of coke was made that was far from standard, the difference being that at that time it was shipped to furnaces billed as furnace coke at $6 and was accepted and paid for as such. For strictly first-grade coke furnace may be quoted at $5 and foundry at $6 per net ton at ovens, spot or prompt shipment. There is no contract market as there is no inquiry.

The coal outlook is that relatively high prices will continue, particularly for special grades of coal, gas and byproduct. With so many byproduct ovens completed of late there is a large excess of coking capacity, and with high prices obtainable for byproduct coal the Connellsville region is likely to ship raw coal largely, and sell what coke it can at the bare cost of coking, above the market value of the coal.

Many contracts for furnace coke requiring prices to be adjusted after the disappearance of Government control have been set at $5.50 for February deliveries. The settlement is now admitted to have been rather high, and the furnaces will probably get something in return when March prices are set. The other class of contracts, those that called for "last Government price," are not proving such an asset to the operators as the operators had expected, since it has now become rather generally recognized that some concessions will have to be made from the contract terms, otherwise the furnaces holding the contracts are likely to go out of blast and take no coke at all.

The "Courier" reports coke production in the Connellsville and Lower Connellsville region in the week ended Feb. 1 at 262,644 tons, a decrease of 14,680 tons, and raw coal shipments at 171,399 tons, a decrease of 18,308 tons.

Buffalo—The coke trade is dull. Some say that all grades of it are down, but as a rule it is held that only the off grades are materially affected. Any coke that is used for fuel is hard to sell, but spot foundry is still bringing full $7 per ton for 72-hour at the best ovens. It is expected that the iron furnaces will run strong as soon as the business of the country is back to normal activity, but until it is there must be a falling off of consumption.

Middle Western

GENERAL REVIEW

Prices advance on high-grade Illinois and Indiana coals. Steam trade inactive, with little domestic moving. Eastern coal being kept out of Mid-West market.

Contrary to the general opinion of the average coal purchasing agent, coal prices, effective Feb. 1, 1919, advanced in Illinois and Indiana, rather than declined, as had been perhaps too confidently expected by the buying public. It is true that only the highest grade coals produced in the two states just mentioned are influenced by an advance, but it is a healthy sign, as it shows pretty conclusively that the operator does not intend to go back to pre-war price-cutting conditions. Generally speaking, the advance amounts to 20c. per ton on the prepared sizes. No increases have been made in mine run or screenings, although it is generally predicted that steam coals will advance perhaps 10c. or 15c. per ton, in order to keep in line with the prepared sizes.

It is a remarkable thing that the operators have been able to put this increase in effect, especially in view of the fact that the coal market is weaker than it has been in the last four or five years. It shows, among other things, that through Government control, the operators have learned to figure their costs accurately. Furthermore, they have been pretty well taught the folly of indiscriminate price cutting.

The steam trade remains inactive, with little hope for the immediate future. There are two or three reasons for this. The first is that practically all manufacturers are awaiting developments, and consequently either closing their plants or working only a fraction of the week. How long this state of affairs will continue is open to debate. The second reason for a dull market is that the big buyers of steam coal are waiting to see what sort of a deal the operators will be able to make with the railroads, as it is generally conceded that all big contracts will be patterned after railroad contracts, especially in regard to price. It is hoped that the railroads will be brought to see the light, as there is little justice in selling coal to them at cost or below, and charging the small buyers cost plus a sum large enough to maintain a fair average of profit on all sales. The third reason for a dull steam coal market is that a very substantial tonnage of coal still remains in storage. For instance, one plant in Northern Michigan, normally using 40,000 tons per year, has on the ground approximately 23,000 tons.

The domestic coal situation remains a weather proposition, and consequently, on account of the mild spring days we have had throughout the territory, but little domestic coal is moving. One surprising feature has developed, however, with the lifting of zone restrictions, and that is very little Eastern coal is moving into the Mid-West territory. The retailers have made an organized effort to keep Eastern coal out until such time as their stocks of Indiana and Illinois coals have been depleted. If the territory enjoys a three- or four-week period of cold weather, it will probably bring about an influx of high-grade Eastern coal.

CHICAGO

Prices being maintained, except on off-grade coals. High grade coal prices advanced. Plenty of anthracite available.

In Chicago, coal prices are holding firm, with the exception, of course, of the off-grade coals that have been selling at a discount since last August. The domestic trade was surprised to hear of the advance, effective Feb. 1, decided upon by the Franklin County operators. They were still more surprised to learn that other groups of operators in Southern Illinois and Indiana had followed the lead and also advanced their prices. It is pretty generally conceded that the coals affected by the advance are worth at least 20c. per ton more than the ordinary Indiana and Illinois product, worth more from both the standpoint of quality and preparation.

The mild weather in Chicago has had a big bearing on the present market, and it is felt that a continued spell of cold weather will stimulate production to at least 60 per cent. As it is now, the factories are burning much less coal than normally, and the householder is doing the same thing.

Anthracite coal has ceased to be a "news feature" in market reports, as all the hard coal wanted is easily obtainable.

MILWAUKEE

Advent of colder weather injects a little animation into a dejected market. City and country orders more encouraging. No indication of a break in prices.

A few days of near-zero weather along Lake Michigan, and colder blasts, amounting to a blizzard in some sections of the immediate interior, have served to inject a spasm of life into the coal market, which has been in the doldrums thus far this winter. Orders from both city and country are more encouraging than they have been for weeks. The future of the market depends altogether on the weather. Should another protracted mild spell ensue, it would have a demoralizing effect, as dock companies would have to count on retaining considerable holdings at the end of the coal year on Mar. 31.

At present there are no indications of a decline in prices, which would mean losses to the large dealers. As one distributor put it: "All the coal in Milwaukee was purchased at a 'peak' market. In many cases transfer to the city was made under severe difficulties, and often only through the aid of the fuel administration. The coal cannot be sold lower than existing rates." However, the future of bituminous coal prices rests with western producers, as jobbing and retail prices must be governed by what is paid at the mines. If the mine companies begin cutting there is bound to be a break in soft coal.

Dealers have been allowed a margin of $2.25 for handling each ton of coal other than Illinois. For handling Illinois coal $3.05 has been permitted, because of the greater shrinkage incurred during the process of handling the Illinois product. Illinois prepared sizes are now held at $7.90 carried in. Hocking lump and stove sell for $8.40 and splint lump and stove and Kentucky lump and smithing at $8.90, also carried in.

Anthracite prices continue without change. Chestnut is scarce, however, and commands $13 per ton in bins. Coke is also firmly held.

ST. LOUIS

A continued lagging market with warm weather and no demand of any kind. Cars plentiful and movement good. Mines working one and two days a week. Country demand light.

Warm weather continues and the market is lifeless. There is no domestic demand to speak of except in small quantities here and there, and the steam demand is almost nothing.

The larger plants that are running are using their storage supplies, and there are many plants that are running short time or not at all. There seems to be a sort of business depression in general so far as the manufacturing interests are concerned, due to the stopping of war activities. This promises, however, to be shortlived, and industrial conditions ought soon to renew their normal position. The country demand on all grades is extremely easy. What little coal is moving out is usually forced.

The Standard field still continues to sell coal for below production cost in a general way. Screenings are down to about $1.10, 2-in. lump from $1.50 to $1.75, and 6-in. lump from $1.75 up, with mine-run at about $1.65 to $1.75.

There is a little railroad coal moving out of this district, but the tonnage is small. The operators are facing critical times on account of lack of tonnage, and with growing dissatisfaction among their men. The mines are working from one to two days a week as a rule, and some mines not that much.

In the Mt. Olive field the working conditions are not much better than in the Standard field. There is a fair movement of this coal northwest, and a little railroad tonnage, but the amount of coal from this field coming into the St. Louis market is extremely light. The prices, however, are pretty well maintained, the Government maximum of $2.55 practically prevailing. Screenings are weak and selling below the Government price slightly. There is dissatisfaction here among the miners on account of insufficient work.

In the Carterville field, the Williamson and Franklin Counties, as well as the Du Quoin field, the overproduction continues to increase and the mines are idle on account of lack of orders for all sizes. The steam sizes, however, are the most troublesome. Few mines in this section are working full time.

The price here since the first of the month on the Franklin County coal has gone to $2.75 on domestic sizes. In the Williamson and Franklin County fields some of the operators, fearing Government action, are sticking to the Government price of $2.55, while a few of them have raised to the $2.75 price with the Franklin County operators.

Working time is sufficient in this field to keep the miners pretty well satisfied although the operators claim that they had to raise the price in order to cover the cost of production by the shorter working time and the increasing overhead.

There is a small tonnage of smokeless coal, perhaps from 15 to 25 cars in all, that have been ordered for St. Louis. Anthracite continues to come in in fairly good volume, but there is no local demand for any of the sizes.

There is no Arkansas moving in and coke shipments are almost at a standstill.

The market here, with the exceptions as noted above, is as follows:

	Mt. Olive and Staunton	Standard	
Franklin County:			
Prepared sizes (lump, egg, Nos. 1 and 2 nut)	$2.75	.....	.....
Williamson County:			
Prepared sizes (lump, egg, nut)	$2.55	$2.55	(As noted
Mine-run	2.20	2.20	above)
Screenings	2.05	2.05	.....

Williamson-Franklin rate to St. Louis is $1.10; other rates, 95c.

General Statistics

NORFOLK & WESTERN COAL TONNAGE

Below is given a statement of the coal tonnage from mines on the Norfolk & Western R.R., and from other railroads, for the month of December, 1918:

From	Net Tons
Pocahontas field	966,141
Tug River district	194,455
Thacker district	191,253
Kenova district	60,284
Clinch Valley district	97,433
Other Norfolk & Western fields	7,851
Total Norfolk & Western fields	1,517,417
Williamson & Pond Creek R.R.	155,335
Tug River & Kentucky R.R.	44,520
All other railroads	97,956
Grand total	1,815,228

GEOLOGICAL SURVEY'S FIGURES ON COAL COKE OUTPUT IN 1918

Bituminous coal production in 1918 was nearly 35,000,000 tons greater than that of 1917. The Geological Survey has compiled the following statement of production, by months:

Months	1917	1918
January	47,967,354	42,607,206
February	41,352,711	44,384,957
March	47,868,652	48,631,115
April	41,854,320	46,590,570
May	47,086,452	50,927,195
June	46,824,646	51,758,214
July	46,291,572	55,587,312
August	47,372,226	55,732,092
September	45,107,956	51,757,334
October	48,337,726	52,885,513
November	47,689,801	44,386,952
December	44,037,147	40,634,575
Total	551,790,563	585,883,000

Coke production in 1918 exceeded that of 1917 by slightly more than 1,000,000 tons. The following table shows production by months for the two years:

	Beehive		Byproduct	
Months	1917	1918	1917	1918
Jan.	2,923,056	2,242,362	1,787,850	1,649,819
Feb.	2,489,888	2,234,281	1,806,773	1,562,0[illegible]
Mar.	3,138,977	2,630,433	1,813,435	2,051,[illegible]
Apr.	2,813,935	2,580,931	1,859,278	2,021,437
May	2,861,364	2,757,719	1,879,268	2,139,204
June	2,754,897	2,712,726	1,880,335	2,092,155
July	2,753,902	2,813,910	1,882,200	2,300,673
Aug.	2,649,755	2,657,022	1,914,450	2,387,675
Sept.	2,727,367	2,570,238	1,918,714	2,410,798
Oct.	2,780,436	2,611,885	1,898,192	2,563,183
Nov.	2,677,284	2,339,197	1,899,526	2,523,746
Dec.	2,596,687	2,255,296	1,899,259	2,562,048
Total	33,167,548	30,406,000	22,439,280	26,264,000

CURRENT PRICES—MATERIALS & SUPPLIES

IRON AND STEEL

PIG IRON—Quotations are f.o.b. cities named, unless noted otherwise.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$35.85	$37.60
Northern Basic	31.80	34.80
Southern Ohio No. 2	32.80	35.80
NEW YORK, Tidewater delivery		
Penna. 2X	36.15	39.55
Southern No. 2 (Silicon 2.25 to 2.75)	39.95	.....
BIRMINGHAM		
No. 2 Foundry	31.00	34.00
PHILADELPHIA		
Eastern Pa. 2X	36.15*	39.15*
Virginia No. 2	38.10†	40.50†
Basic	33.90*	36.90*
Grey Forge	33.90*	36.90*
Bessemer	.....	39.10*
CHICAGO		
No. 2 Foundry Local	31.00	34.50
No. 2 Foundry Southern	37.20	39.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	31.00	35.40
Basic	30.00	34.40
Bessemer	32.20	36.60

*F.o.b. furnace. †Delivered

STRUCTURAL MATERIAL—The following are the base prices, f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York One Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2.80	$4.07	$4.19½	$4.14	$4.07
Channels, 3 to 15 in.	2.80	4.07	4.19½	4.14	4.07
Angles, 3 to 6 in., ¼ in. thick.	2.80	4.07	4.19½	4.14	4.07
Tees, 3 in. and larger	2.80	4.12	4.19½	4.14	4.07
Plates	3.00	4.27	4.44½	4.14	4.27

BAR IRON—Prices in cents per pound at cities named are as follows:

Pittsburgh	St. Louis	Denver	Birmingham
3.70	4.04	4.85	4.20

NAILS—Prices per keg from warehouse in cities named:

	Mill Pittsburgh	St. Louis	Denver	Chicago	Birmingham	San Francisco	Dallas
Wire	$3.50	$4.37	$5.11	$4.37	$4.50	$5.40	$4.75
Cut	5.00	6.50	5.61	6.50	.....	6.75	.....

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh	Cincinnati	Chicago	St. Louis	San Francisco	Birmingham	Denver
Standard railroad spikes ⅝-in. and larger	$3.70	$6.00	$4.50	$5.04	$6.15	$5.25	$5.55
Track bolts	4.90	8.90	5.50	Prem.	7.50	8.00	6.55
Standard section angle bars	.....	.....	4.45	Prem.	5.15	.....	4.95

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring fair-sized lots, the following discounts hold:

Cincinnati	Cleveland	Chicago	St. Louis	Denver	Birmingham
17½%	+7%	+9%	+15%	+30%	+20%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$6.25	$7.75	$6.50	$7.25	$8.00	$7.60
Assorted	6.40	7.75	6.50–7.00	6.40	8.25	7.85

Cincinnati—Horseshoe nails sell for $4.50 to $5 per 25-lb. box.

CAST-IRON PIPE—The following are prices per net ton for carload lots

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco
4-in.	$65.70	$70.70	$58.35	$64.80	$58.00	$80.50
6-in. and over.	62.70	67.70	55.35	61.80	55.00	77.50

Gas pipe and 16-ft. lengths are $1 per ton extra.

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard Bessemer rails	$55.00	$60–65	$67.00	$38.00
Standard openhearth rails	57.00	63–65	65.00	40.00
Light rails, 8 to 10 lb.	3.135 (100 lb.)	3.125*	3.135 (100 lb.)	43.50
Light rails, 12 to 14 lb.	3.09 (100 lb.)	3.125*	3.09 (100 lb.)	49.00
Light rails, 25 to 45 lb.	3.00 (100 lb.)	3.125*	3.00 (100 lb.)	30.00

*Per 100 lb.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York	Chicago	St. Louis
No. 1 railroad wrought	$18.50	$17.00	$17.00
Stove plate	14.50	17.50	16.00
No. 1 machinery cast	17.00	22.00	20.00
Machine shop turnings	10.00	8.50	7.50
Cast borings	10.50	11.50	10.50
Railroad malleable cast	14.50	16.50	17.00

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver
$0.12	$0.16½	$0.18	$0.13	$0.18½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	16c.	13c.	15c.
Hollow	24c.	...	...

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Jan. 1, 1919 for steel pipe and for iron pipe:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	47%	20½%	⅜ to 1¼	36%	20%
½	51%	36½%			
¾ to 3	54%	40½%			

LAP WELD

2	47%	34½%	2	29%	15%
2½ to 6	50%	37½%	2½ to 4	31%	18%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	43%	25½%	⅜ to 1¼	36%	21%
½	48%	35½%			
¾ to 1¼	52%	39½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45%	33½%	2	30%	17%
2½ to 4	48%	36½%	2½ to 4	32%	20%
4½ to 6	47%	35½%	4½ to 6	31%	19%

Stocks discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Malvanized
⅛ to 3 in. steel butt welded	43%	27%	43%	26%	44.9%	29.9%
3½ to 3 in. steel lap welded	38%	23%	39%	23%	40.9%	26.9%

Malleable fittings. Class B and C, from New York stock sell at list + 15%. Cast iron, standard sizes, 10% off.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+17½%
Galvanized cast steel rigging	+2½%
Bright plain rigging	30%
Bright cast steel	17½%
Bright iron and iron tiller	List

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
*No. 28 black	4.70	6.22	6.22	6.45	5.75	6.45	6.22	6.45
*No. 26 black	4.60	6.12	6.12	6.35	5.65	6.35	6.12	6.35
*Nos. 22 and 24 black	4.55	6.07	6.07	6.30	5.60	6.30	6.07	6.30
Nos. 18 and 20 black	4.50	6.02	6.02	6.25	5.50	6.25	6.02	6.25
No. 16 blue annealed	4.10	5.37	5.37	5.65	4.95	5.65	5.37	5.65
No. 14 blue annealed	4.00	5.27	5.27	5.55	4.85	5.55	5.27	5.55
No. 10 blue annealed	3.90	5.17	5.17	5.45	4.75	5.45	5.17	5.45
*No. 28 galvanized	6.05	7.57	7.57	7.70	7.15	7.70	7.57	7.70
*No. 26 galvanized	5.75	7.27	7.27	7.40	6.85	7.40	7.27	7.40
No. 24 galvanized	5.60	7.12	7.12	7.25	6.70	7.25	7.12	7.25

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$0.80	$1.00	$1.25	$1.40	$0.98	$1.05
Hot pressed hexagon	.80	1.00	1.05	1.20	.78	.85
Cold punched square	2.50*	1.00	.75	.75	1.00	1.00
Cold punched hexagon	2.50*	1.00	.75	.75	1.00	1.00

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50—10%	40%
Chicago	50%	50%
Cleveland	50—10%	60%

MACHINE BOLTS—Warehouse discounts in the following cities

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	40—10%	40—10%	40%
Larger and longer up to 1 in. by 30 in.	20—5%	20—5%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..$1.25 Cleveland..$1.25 Chicago..$1.75

For cast-iron washers the base price per 100 lb. is as follows:
New York..$6.00 Cleveland..$4.25 Chicago..$4.50

RIVETS—The following quotations are allowed for fair sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	45—5%	40%
Tinned	30%	45—5%	40%

Boiler, ¾, ⅞, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:
New York..$6.60 base Cleveland..$5.15 Chicago..$5.67 Pittsburgh...$4.65

Structural, same sizes:
New York..$5.67 Cleveland..$5.25 Chicago..$5.77 Pittsburgh...$4.75

CONSTRUCTION MATERIALS

LINSEED OIL—These prices are per gallon.

	New York — Current	New York — One Year Ago	Cleveland — Current	Cleveland — One Year Ago	Chicago — Current	Chicago — One Year Ago
Raw in barrel	$1.49	$1.31	$1.65	$1.35	$1.66	$1.32
5-gal. cans	1.74	1.41	1.80	1.50	1.86	1.45

WHITE AND RED LEAD—Base price.

	Red — Current Dry	Red — Current In Oil	Red — 1 Year Ago Dry	Red — 1 Year Ago In Oil	White — Current Dry and In Oil	White — 1 Year Ago Dry and In Oil
100-lb. keg	13.00	14.50	12.25	12.50	13.00	12.50
25 and 50-lb. kegs	13.25	14.75	12.50	12.75	13.25	12.25
12½-lb. keg	13.50	15.00	12.75	13.00	13.50	12.50
5-lb. cans	15.00	.....	14.25	14.00	15.00	14.50
1-lb. cans	16.00	.....	14.25	14.50	16.00	14.50

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

COMMON BRICK—The prices per 1000 in cargo or carload lots are as follows:
Cincinnati..$15 and 16 Birmingham..$15.00
St. Louis, salmon..12.00 Denver..12.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco.

	1-Ply C.I.	1-Ply L.C.I.	2-Ply C.I.	2-Ply L.C.I.	3-Ply C.I.	3-Ply L.C.I.
No. 1 grade	$1.35	$1.60	$1.70	$1.95	$2.05	$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt saturated felt (14 lb. per square) costs $5.00 per 100 lb.
Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.10 per roll in carload lots and $2.35 for smaller quantities.
Shingles, red and green slate finish cost $5.75 per square in carloads, $5.75 in smaller quantities, in Philadelphia.

ROOFING MATERIAL—Prices per ton f. o. b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$64.00	$57.00	$65.00	$58.00
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	36.00	36.00	41.50	41.50
Asphalt felt	67.50	67.50	72.00	72.00

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	4x12x12	8x12x12	12x12x12
St. Paul	$0.056	$0.11	$0.162
Cincinnati	.086	.165	.218
Seattle	.09	.175	.30
Los Angeles*	.074	.144	.181
New Orleans	.16	.20	.29

*F. o. b. factory, 4, 8 and 10 inch.

LUMBER—Price of yellow pine per M in carload lots:

	1-in. Rough 10 In. x 16 Ft.	2-In. T. and G. 10 In. x 16 Ft.	8 x 8 In. x 20 Ft.
St. Louis	$38@41	$38.00	$40.00
Birmingham	33.00	33.00	28.50
Denver	43.00	35.00	43.00
Cincinnati	43.00	42.00	37.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25-lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.29½	$0.34½	.....	$2.40
Boston	$0.23½	.26½	.31½	$0.35½	2.65
Cincinnati	.18½	.22½	.26½	.....	2.35
Kansas City	.20½	.25½	.30½	.38½	2.45
New Orleans	.20¾	.26½	.31½	.37½	2.60
Seattle	.....	.25½	.32½	.....	.....
Chicago	.18½	.22½	.30	.36	2.35
St. Paul	.19	.25½	.30½	.....	2.45
St. Louis	.19	.25¼	.30¼	.36¼	.....
Denver	.17½	.24	.29	.35	2.45
Dallas	.21	.25	.29	.39	.....
Los Angeles	.21	.28	.34	.....	2.95

MISCELLANEOUS

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	St. Louis	Birmingham	Denver
Cup	7	7.2	8½	14½
Fiber or sponge	8	13	9½	18
Transmission	7	13	7½	20
Axle	4½	4½	3½	5½
Gear	4½	7½	5½	9
Car journal	22 (gal.)	4.9	6¼	8

BABBITT METAL—Warehouse prices in cents per pound:

	New York — Current	New York — One Year Ago	Cleveland — Current	Cleveland — One Year Ago	Chicago — Current	Chicago — One Year Ago
Best grade	87.00	70.00	80.00	93.00	75.00	70.00
Commercial	42.00	40.00	21.50	22.00	15.00	25.00

HOSE—Following are prices of various classes of hose:

	Fire 50-Ft. Lengths
Underwriters' 2½-in	80c. per ft.
Common, 2½-in	30%

	Air First Grade	Air Second Grade	Air Third Grade
¾-in. per ft	$0.55	$0.40	$0.30

Steam—Discounts from list
First grade..25% Second grade..35% Third grade..40%

LEATHER BELTING—Present discounts from list in cities named:

	Medium Grade	Heavy Grade
St. Louis	45%	50%
Denver	35–5%	30%
Birmingham	30%	35%
Chicago	45%	35%
Cincinnati	40–10%	30%

RAWHIDE LACING—50% for cut; 45c. per sq.ft. for ordinary.

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.90
Asbestos for high-pressure steam	1.60
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.60
Compressed asbestos sheet	1.00
Wire insertion asbestos sheet	1.20
Rubber sheet	.60
Rubber sheet, wire insertion	.80
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.20
Asbestos wick, ½- and 1-lb. balls	.85

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft.; ½-in., 6; ¾-in., 4½; 1 in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ¼-in. and larger, in 1200-ft. coils:

Boston	$0.24	Birmingham	$0.28
New York	.23	Denver	.22
Cincinnati	.24	Kansas City	23½
Chicago	21½	Seattle	.24
St. Paul	.23	St. Louis	21½
San Francisco	.22	Los Angeles	.25

PIPE AND BOILER COVERING—Below are discounts and part of standard lists:

PIPE COVERING Pipe Size	Standard List Per Lin. Ft.	BLOCKS AND SHEETS Thickness	Price per Sq.Ft.
1-in.	$0.27	½-in.	$0.27
2-in.	.36	1 -in.	.30
6-in.	.80	1½-in.	.45
4-in.	.60	2 -in.	.60
3-in.	.45	2½-in.	.75
8-in.	1.10	3 -in.	.90
10-in.	1.30	3½-in.	1.05
85% magnesia high pressure			List
For low-pressure heating and return lines			4-ply..... 58% off 3-ply..... 60% off 2-ply..... 62% off

WIRING SUPPLIES—New York prices for tape and solder are as follows:

Friction tape, ⅙ lb. rolls	48c. per lb.
Rubber tape, ½-lb. rolls	60c. per lb.
Wire solder, 50-lb. spools	46c. per lb.
Soldering paste, 2-oz. cans	$1.20 per doz.

COPPER WIRE—Prices per 1000 ft. for rubber-covered wire in following cities:

No.	Denver Single Braid	Denver Double Braid	Denver Duplex	St. Louis Single Braid	St. Louis Double Braid	St. Louis Duplex	Birmingham Single Braid	Birmingham Double Braid	Birmingham Duplex
14	$15.00	$19.00	$38.40	$12.00	$16.00	$33.00	$12.50	$17.90	$36.30
10	22.65	29.05	58.25	27.20	31.00	69.00	30.30	34.30	67.60
8	31.95	39.20	78.65	38.00	42.00	78.00	42.35	46.85	.....
6	54.40	58.10	.....	.....	65.00	130.00	69.60	74.10	.....
4	77.50	83.00	.....	.....	93.00	.....	101.75	106.55	.....
2	115.30	123.50	.....	.....	140.00	.....	156.50	163.00	.....
1	150.05	161.20	.....	.....	182.00	.....	201.00	209.50	.....
0	.....	179.05	.....	.....	242.00	.....	276.00	285.50	.....
00	.....	243.35	.....	.....	290.00	.....	317.00	330.00	.....
000	.....	296.65	.....	.....	360.00	.....	467.00	428.50	.....
0000	.....	361.50	.....	.....	435.00	.....	508.00	516.00	.....

FREIGHT RATES—On finished steel products in the Pittsburgh district including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates per 100 lb. are effective:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Philadelphia	.24½
Cincinnati	.23	St. Louis	.24
Cleveland	.17	St. Paul	.49½
Denver	.99	Pacific Coast (all rail)	1.25*
Kansas City	.59		

Note—Add 3% transportation tax. *Minimum carload, 80,000 lb.